

# ATTITUDE SURVEY ON LIVE REEF FISH CONSUMPTION IN SABAH



March 2011

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**Cover photo: Live reef fish in a fish cage in Kudat, Sabah.**

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# **Attitude Survey on Live Reef Fish Consumption in Sabah:**

**A Consumer Attitude Survey**

**A Restaurant Manager Attitude Survey**

Connie Fay Komilus

Pauline Chin

Kenneth Kassem

Angela Lim

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Connie Fay Komilus

Pauline Chin

Kenneth Kassem

Angela Lim

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Maurice Knight

Chief of Party, US Coral Triangle Support Partnership (CTSP)

One Wolter Place - Mezzanine Fl.

Jl. Wolter Monginsidi No.63B

Kebayoran Baru, Jakarta 12180, Indonesia

Indonesia Phone: +62-81-116-0837/Fax: +62-21-576-1080

US Phone: 202-468-4502/Fax: 202-293-9211

[maurice.knight@wwfus.org](mailto:maurice.knight@wwfus.org)

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This report based surveys on WWF-Hong Kong's "An Integrated Attitude Survey on Live Reef Food Fish Consumption in Hong Kong" by Noel W. W. Chan, August, 2000. However, any errors are solely the responsibility of the authors. This report would not be possible without generous funding and continued support from WWF-US.

## EXECUTIVE SUMMARY

Sabah, Malaysia's second largest state located at the northern-most portion of Borneo, has 75% of Malaysia's coral reefs which is reportedly important for the capture and export of live reef fish to restaurants throughout Southeast Asia. (Busing 2004, Daw *et al.* 2003). Considered as a *halal*, luxury and healthy food in Sabah, live reef fish (LRF) are sold in most seafood restaurants and this has positioned Sabah as the "Little Hong Kong of Borneo". As the true magnitude of exploitation of live reef fish is still unknown, this study attempts to document the consumption patterns, conservation awareness and willingness to change food preferences amongst live reef fish trade consumers and restaurant managers in Sabah.

The survey found an overwhelming proportion of respondents (84%) who liked eating LRF. LRF is a highly-sought for food among professionals and those involved in the service industry due to its taste, freshness and texture. Consumers at age group of 21 to 50 years old are major consumers and may be regarded as the *elite* consumers of LRF. Consumers adopted the norm of eating LRF in Sabah as a social affair rather than as tradition or for special occasions every time they patronized seafood restaurants. Other attributes to the norm were the sense of ownership and pride on the LRF availability in Sabah.

Popular LRF chosen by consumers were groupers of the red and brown species. The three most important factors considered by consumers in choosing LRF were the freshness of the fish, species and the fish's price. The most desired size for fish are those less than 1kg or 1-1.5kg with prices less than RM150. A high percentage (61%) of the respondents was not aware that humphead wrasse and giant grouper were vulnerable species. Although this indicates a lack of awareness on the conservation status of LRF consumed, nearly 70% of the respondents were willing to accept farmed reef fish or freshwater fish as alternatives to wild-caught LRF.

Restaurant managers' attitude at both Kota Kinabalu and East Coast of Sabah demonstrated a high degree of concern on overfishing, cyanide fishing and selling of juvenile fish. Responses from managers of both areas differed in some aspects like the level of concern on detrimental trend of LRF populations, guarantee on non-cyanide caught LRF, size of fish and green image trademark to the LRF trade.

Size of fish matters to all managers because they would not purchase very small sized or immature fish. Managers of LRF restaurants responded positively to the idea of projecting a green image trademark in restaurants (62.5% in Kota Kinabalu and 43% in East Coast respectively). Assurance from most of the restaurant managers were obtained in supporting sustainable LRF by promoting environmentally friendly live reef fish consumption through pamphlets or posters to customers.

In conclusion, both consumers and managers have a general consensus that some reef fish are threatened and they expressed their efforts towards combating illegal fishing methods like cyanide fishing. Customers were also willing to shift to other alternatives while managers agreed to a LRF green image trademark projection in their restaurants as a symbol of supporting sustainable LRF.

## ABBREVIATIONS

ADB	Asian Development Bank
GG	Giant grouper
gm	gram
halal	A term used to designate food as permissible by Islamic law
HHW	Humphead wrasse
i.e.	That is
IUCN	International Union for Conservation of Nature
kg	Kilogram
LRF	Live reef fish
LRFF	Live reef food fish
LRFT	Live reef fish trade
NGO	Non-Governmental Organisation
pm	evening
RM	Ringgit Malaysia
PSP	Paralytic Shellfish Poisoning
Sdn Bhd	Sendirian Berhad
SPSS	Statistical Package for Social Science
USD	United States Dollar
WWF	World Wide Fund for Nature
WWF-US	World Wildlife Fund United States
%	Percent

## 1. INTRODUCTION

The East Malaysian state of Sabah, on the northern-most portion of Borneo, is Malaysia's second largest state and has 75% of Malaysia's coral reefs. Concentrated around Kudat, Sandakan and Semporna, these reefs have long supported important fisheries for the local population. Today, they are also important for the capture and export of live reef fish to restaurants throughout Southeast Asia. (Busing 2004, Daw et al. 2002).

The majority of LRF caught throughout Southeast Asia, including Sabah, have traditionally been exported to Hong Kong where they may be consumed or transhipped to mainland China. The lucrative export trade of LRF from Sabah targets reef dwelling groupers (*Serranidae*), certain species of wrasse (*Labridae*) and snappers (*Lutjanidae*) (Daw 2004) to Hong Kong and also to other markets in the region including Singapore, Kuala Lumpur, and even within Sabah.

The live reef food fish (LRFF) trade has an estimated annual retail value of USD1 billion in the Asia-Pacific region (Pomeroy et al. 2008). In 2007, Sabah exported a total of RM6.7 million worth of live fish (Department of Fisheries Sabah, 2007) while in 2008, it was reported that the export of live fish was worth RM6 million. The average beach prices for LRF are very lucrative for fishers, especially selected species such as humphead wrasse (*Cheilinus undulatus*) and groupers. The prices for humphead wrasse and mouse grouper (*Cromileptes altivelus*) are reported to be stable except during festive seasons during which it has been reported that live humphead wrasse is worth USD75-125 per kilogram and grouper is USD82-118 per kilogram (ADB 2003).

Live reef fish is a high value product sold in most seafood restaurants in Sabah to cater for local and, increasingly, tourist demands. According to Sabah Tourism Board (2010), 33.1% of total tourists to Sabah consist of international tourists mostly from ASEAN countries. Tourists from Brunei (22.4%), China and Hong Kong (13.2%), South Korea (9.3%), Taiwan (6.5%) and Japan (4.5%) are known to be frequent patrons of Sabah's seafood restaurants. To many people, including domestic consumers, LRF is considered as a *halal*, luxury and healthy food available in Sabah which has positioned Sabah as the "Little Hong Kong of Borneo".

As anticipated, the branding of Sabah as the seafood haven for tourism is exerting significant pressure on the marine environment and its fisheries resources. The true magnitude of exploitation of live reef fish is unknown because the trade in Sabah is carried out through informal marketing chains and very little information is captured in government statistics.

There is also an increasing recognition that the live reef fish trade in Malaysia has far-reaching effects. The rising trend of this trade to supply markets and consumers both locally and across the Southeast Asian countries has significant implications for conservation and sustainability of the resources. The trade is causing the decline in many wild reef fish, a growing number of these species becoming locally rare and threatened. This reduction and the possible un-sustainability of the trade of live reef fish will impact marine resources, habitats, and the people dependent on them.

The continuous exploitation of natural marine resources threatens to destroy the habitats and the very species that the live fish trade depends upon. While the reefs in Sabah and the neighbouring waters can still supply live reef fish, there is evidence of overfishing throughout Sabah. Surveys conducted around Pulau Banggi in northern Sabah between 2002 and 2004 discovered that live reef fish trade species were found only in very low numbers or totally absent (Koh et al. 2002, Lee and

Chou 2003, Tanzil and Chou 2004). Teh et al. (2005) reported that while coral reef fisheries around the same area are not showing signs of extreme overfishing as in other areas of Sabah, there is cause for concern, particularly with live reef fish species such as humphead wrasse (*Cheilinus undulatus*) and mouse grouper (*Cromileptes altivelis*), Scales et al. (2007) reported significant declines in live reef fish on the coral reefs around Pulau Banggi. Unpublished reports of similar declines on the reefs of Semporna are also available.

This scenario is of public concern and well recognized by the Sabah Government, resulting in the export ban of humphead wrasse, one of the most popular live reef fish for consumers in Hong Kong, beginning from January 2010.

The lack of awareness and understanding of the LRFT economics and its impacts remain a challenge for policy makers to develop workable and efficient approaches to ensure that the development of this trade remains significantly viable for the economy. Therefore, there is a need for reliable, current and evidence-based data to ensure conservation efforts are addressed more holistically. While the majority of Sabah's live reef fish landings are thought to be exported, there is increasing concern about the prevalence of restaurants and consumption in Sabah. Changing travel patterns in the region have resulted in more direct flights to Sabah bringing more tourists from China and around the region. Cooking and travel programmes in Hong Kong have highlighted Sabah as a culinary-tourism destination. Thus, it is important to begin to understand the patterns of consumption in Sabah and to address domestic consumption as a potential contributor to population declines.

This study attempts to document the consumption patterns, conservation awareness and willingness to change food preferences amongst live reef fish consumers and restaurant managers in Sabah. This study also represents a preliminary step towards addressing the information gaps identified in the Live Reef Fish Trade, focusing on consumers' and restaurant managers' attitude and perception towards the exploitation and conservation of live reef food fish.

The results of the survey include identification of the integrated attitude survey at both ends of LRFT, understanding of the demand and supply chains of LRFT and obtaining baselines data for impacts of LRFT. The results obtained will be used to formulate educational and public awareness campaigns, directed at the conservation of the live reef fish, especially the more vulnerable species, such as the humphead wrasse, which is listed as "endangered" by the International Union for Conservation of Nature (IUCN).

## 2. AIMS AND OBJECTIVES

This integrated attitude survey encompasses two attitude surveys – the Consumer Attitude Survey and the Restaurant Manager Attitude Survey.

2.1 The **Consumer Attitude Survey** aims to report on the attitude of Kota Kinabalu's LRF consumers towards LRF consumption and conservation.

### 2.1.1 OBJECTIVES:

- i. To identify the profile of major LRF consumer groups in Kota Kinabalu
- ii. To document the LRF consumption patterns and eating habits of LRF consumers in Kota Kinabalu
- iii. To document the preference attributes of LRF by LRF consumers
- iv. To describe the attitudes of LRF consumers towards LRF conservation
- v. To investigate the acceptability of alternatives to LRF to consumers

### 2.1.2 THE SCOPE OF SURVEY COVERS:

1. To find out the profile of major LRF consumers in Kota Kinabalu as follows:
  - i. Nationality
  - ii. Sex
  - iii. Age group
  - iv. Occupation
  - v. Household size
  - vi. Monthly household income
  - vii. Knowledge of LRF trade in Sabah
2. To find out the LRF consumption patterns and eating habits of LRF consumers in Kota Kinabalu:
  - i. Venue of consumption
  - ii. Occasion for consumption
  - iii. Reason for consumption
  - iv. Frequency of consumption

- v. Important factors considered when choosing a LRF
  - vi. Methods of ordering LRF
3. To find out the preference attributes of LRF such as species, sizes and sources by LRF consumers;
  4. To identify the attitudes of LRF consumers towards LRF conservation particularly towards the conservation of humphead wrasse;
  5. To identify LRF consumers awareness of the destructive fishing method of using cyanide in catching LRF.

2.2 The **Restaurant Manager Attitude Survey** aims to report on restaurant managers' attitude towards the conservation of LRF.

**2.2.1 OBJECTIVES:**

- i. To identify the type of LRF sold in seafood restaurants
- ii. To identify the attitudes of seafood restaurant managers towards conservation of LRF

**2.2.2 THE SCOPE OF SURVEY COVERS :**

1. To identify the type of LRF sold in seafood restaurants in Kota Kinabalu, Tawau and Sandakan:
  - i. Species
  - ii. Wild-caught/farmed
2. To find out the attitudes of seafood restaurant managers towards conservation of LRF and towards:
  - i. The purchase of immature/small LRF
  - ii. The decreasing numbers of LRF
  - iii. Measures to address the decreasing numbers of LRF in the form of establishment of minimum size limits for LRF catches or import/ sales ban of LRF species
  - iv. Unethical fishing method using cyanide
  - v. Certified LRF and establishment of green image
  - vi. Alternative(s) in form of farmed reef fish or fresh water fish
  - vii. Educating LRF consumer on LRF conservation

### **3. SURVEY METHODOLOGY**

This integrated attitude survey is comprised of two parts: The Consumer Attitude Survey targeted at seafood restaurant consumers and the Restaurant Manager Attitude Survey targeted at the restaurant managers.

#### **3.1 SURVEY METHOD**

The survey was conducted with structured interviews and questionnaire forms for both the targeted survey groups. Interviews were carried out on-site at the seafood restaurants' premises by trained Universiti Malaysia Sabah and WWF-Malaysia staff and volunteers. Consumer interviews were conducted in the evenings from 7:00 pm to 10:30 pm.

Printed questionnaires with both closed-ended and open-ended questions were used as survey instruments. Survey questionnaires were in English and were translated verbally into Bahasa Malaysia and Chinese when necessary by the enumerators fluent in the respective languages.

The survey questionnaires were modelled after the questionnaires of the "An Integrated Attitude Survey on Live Reef Food Fish Consumption in Hong Kong" (Chan, 2000). The questionnaires from this survey were customised to suit the target respondents and local situation in Kota Kinabalu, Sabah.

A Fish Guide of common live reef fish and fresh water fish sold in seafood restaurants was used as visual aid to identify fish.

Pilot testing was conducted to test the suitability and the functional aspect of the questionnaire. A few flaws in the initial questionnaires were amended accordingly following the pilot testing.

The questionnaires are appended to this report as Appendix 1 and Appendix 2.

#### **3.2 DATA ANALYSIS**

The data were analysed using the Statistical Packages for Social Science (SPSS). Quantitative data were analysed by using relevant statistical manipulation, while qualitative data were arranged into thematic clusters for analysis.

#### **3.3 REPORTING**

Results of the survey were reported according to the survey objectives and scope.

#### **3.4 RESPONDENTS CRITERIA**

Respondents for the Consumer Attitude Survey were consumers aged 15 and above dining in seafood restaurants selling Live Reef Fish in and around Kota Kinabalu, Sabah, Malaysia.

Respondents for the Restaurant Manager Attitude Survey were seafood restaurant managers representing restaurant owners in Kota Kinabalu, Tawau and Sandakan.



### 3.5 SAMPLING METHOD AND SAMPLING SIZE

#### The Restaurant Manager Attitude Survey

Samples were selected from a list of popular seafood restaurants in and around Kota Kinabalu, Tawau and Sandakan for face-to-face interviews with the restaurant managers. Restaurant managers were interviewed by trained staff of Universiti Malaysia Sabah, WWF-Malaysia and Department of Fisheries, Sabah. All restaurant owners were represented by their respective restaurant managers. A total of 15 interviews with the restaurant managers were successfully conducted. This comprised of 8 managers from Kota Kinabalu, 3 managers from Tawau and 4 managers from Sandakan.

#### The Consumer Attitude Survey

This component of the attitude survey employed Purposive Sampling – Disproportionate quota Sampling method<sup>1</sup>.

The live reef fish consumer population in Kota Kinabalu was estimated to be around 144,000 customers per month. The following assumption was made to derive the estimated population size - Each seafood restaurant has an average of 40 tables. Assuming an average of 8 customers per table and turn over per table is twice per night (40 tables X 8 customers per table X 2 turn over = 640 customers per night). With 8 restaurants, this equates to 5,120 diners per night. Over the course of one month, this comes to more than 144,000 diners.

As such, to achieve the confidence level of 95% with margin of error  $\pm 9.8\%$ , the minimum sample size required for this estimated population was 100 respondents.

Following successful face-to-face interviews with the restaurant managers, permission was sought to conduct face-to-face interviews with the restaurant customers within the restaurants' premises. Data collection for consumers was conducted in the order of permission obtained.

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<sup>1</sup> There are generally two types of sampling in market research, Probability and Non-probability sampling. Probability or random sampling gives all members of the population a known chance of being selected for inclusion in the sample. Non-probability sampling may contain sampling bias as only about a proportion of the population has a chance of being included in the sample. Purposive Sampling is the most common of non-probability sampling method where we sample with a *purpose* in mind. We usually have one or more specific predefined groups we are seeking. Purposive sampling is useful for situations where we need to reach a targeted sample quickly and where sampling for proportionality is not the primary concern. Quota Sampling is the most frequently adopted form of Purposive sampling. Disproportionate Quota Sampling is a subtype of Quota Sampling where a specific minimum number of sample is determined. This sampling method is not concerned with having sample size that are proportional to the population.

Samples were chosen randomly and filtered to ensure the suitability of the sample according to the pre-set respondent criteria.

The targeted sample size of 100 respondents was reached after interviewing customers of six (6) seafood restaurants in Kota Kinabalu.

## 3.6 SURVEY LOCATION

### **The Consumer Attitude Survey**

Data collection for the Consumer Attitude Survey was conducted at the following six (6) seafood restaurants around Kota Kinabalu, Sabah, Malaysia:

1. Atlantis Seafood Restaurant, Bundusan
2. Garden Seafood Restaurant, Kota Kinabalu
3. New Gaya Seafood Restaurant, Inanam
4. Ocean Seafood Village, Kota Kinabalu
5. Port View Seafood Village Sdn. Bhd, Kota Kinabalu
6. Gayang Seafood, Karambunai

### **The Restaurant Manager Attitude Survey**

Data collection for the Restaurant Managers Attitude Survey was conducted at the following eight (8) seafood restaurants in Kota Kinabalu:

1. Atlantis Seafood Restaurant, Bundusan
2. Garden Seafood Restaurant, Kota Kinabalu
3. New Gaya Seafood Restaurant, Inanam
4. Ocean Seafood Village, Kota Kinabalu
5. Port View Seafood Village Sdn. Bhd, Kota Kinabalu
6. Gayang Seafood, Karambunai
7. Kampung Nelayan, Bukit Padang
8. Dragon Restaurant, Penampang

In Tawau and Sandakan, interviews were conducted with the managers of the following seven (7) seafood restaurants:

1. Ocean Area Seafood Restaurant, Tawau
2. Goodview Seafood, Tawau
3. Kam Leng Fresh Seafood, Tawau
4. Wing Ling, Sandakan

5. Kampung Pukat, Sandakan
6. Ocean King Seafood, Sandakan
7. Pasir Putih, Sandakan

In 2010, survey was also conducted in Kota Kinabalu to identify active seafood restaurant outlets since 2006. Ten (10) restaurants were identified:

1. 1st Beach Seafood Restaurant, Tanjung Aru, Kota Kinabalu
2. Golden Seafood Restaurant, Tanjung Aru, Kota Kinabalu
3. Ocean Seafood Restaurant, Kota Kinabalu
4. New Gaya Seafood Restaurant, Kota Kinabalu
5. Lucky Seafood Restaurant, Bundusan, Penampang
6. Welcome Seafood Restaurant, Bundusan, Penampang
7. East Ocean Seafood Restaurant, Bundusan, Penampang
8. Restoran Sedap, Luyang, Kota Kinabalu
9. Kim Boo Restaurant, Kota Kinabalu
10. Dowish Seafood Restaurant, Bundusan

### **3.7 SURVEY DURATION**

Surveys were conducted in April and May 2006. Updates on active seafood restaurants in Kota Kinabalu were conducted in September and October 2010.

# PART ONE: CONSUMER ATTITUDE SURVEY IN KOTA KINABALU

## 4. SURVEY RESULTS - CONSUMERS

### 4.1 CONSUMPTION PATTERNS AND EATING HABITS OF LRF CONSUMERS

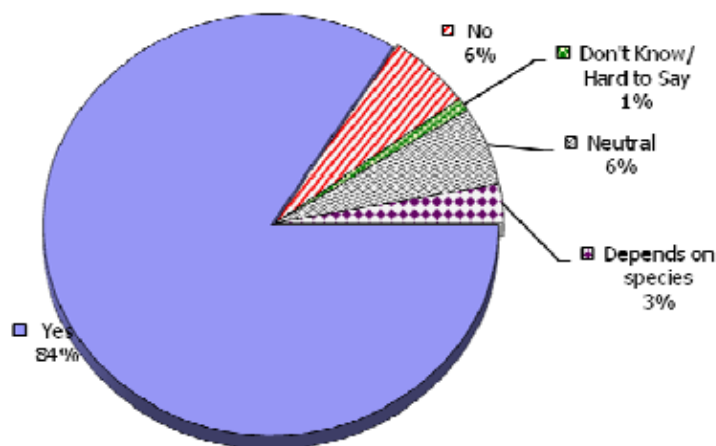
#### 4.1.1 PREFERENCE FOR LIVE REEF FISH (LRF)

84% of consumers interviewed at seafood restaurants like eating LRF, as opposed to 6% who dislike eating LRF. Another 6% were non-committal and 3% stated that their choice of LRF depended on the species. A small 1% did not provide any clue to their preference.

**Table 1:** Preference for LRF

LRF preference	No. of Respondents	Percentage (%)
Yes	84	84
No	6	6
Don't Know / Hard to Say	1	1
Neutral	6	6
Depends on species	3	3
<b>Total</b>	<b>100</b>	<b>100</b>

**Chart 1:** Preference for LRF



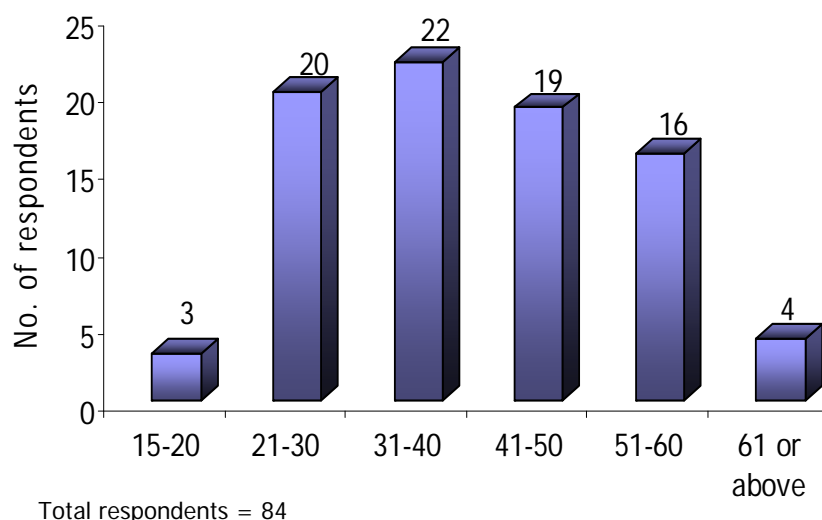
#### 4.1.2 PREFERENCE FOR LRF AMONG THE DIFFERENT AGE GROUPS

Survey result revealed that younger age groups like eating LRF more than those aged over 50 years. Respondents aged 31-40 years were the main consumers of LRF, followed closely by those aged 21-30 years and those aged 41-50 years. Combined, 61 respondents (72.6%) out of the 84 respondents who indicated that they like to eat LRF were in the age bracket of 21-50 years.

**Table 2:** Preference for LRF among the different age groups

Age bracket	Do you like to eat LRF					Total
	Yes	No	Don't Know / Hard to Say	Neutral	Depends on species	
15-20	3	0	0	0	0	3
21-30	20	1	0	0	2	23
31-40	22	5	1	4	1	33
41-50	19	0	0	1	0	20
51-60	16	0	0	0	0	16
61 or above	4	0	0	1	0	5
<b>Total</b>	<b>84</b>	<b>6</b>	<b>1</b>	<b>6</b>	<b>3</b>	<b>100</b>

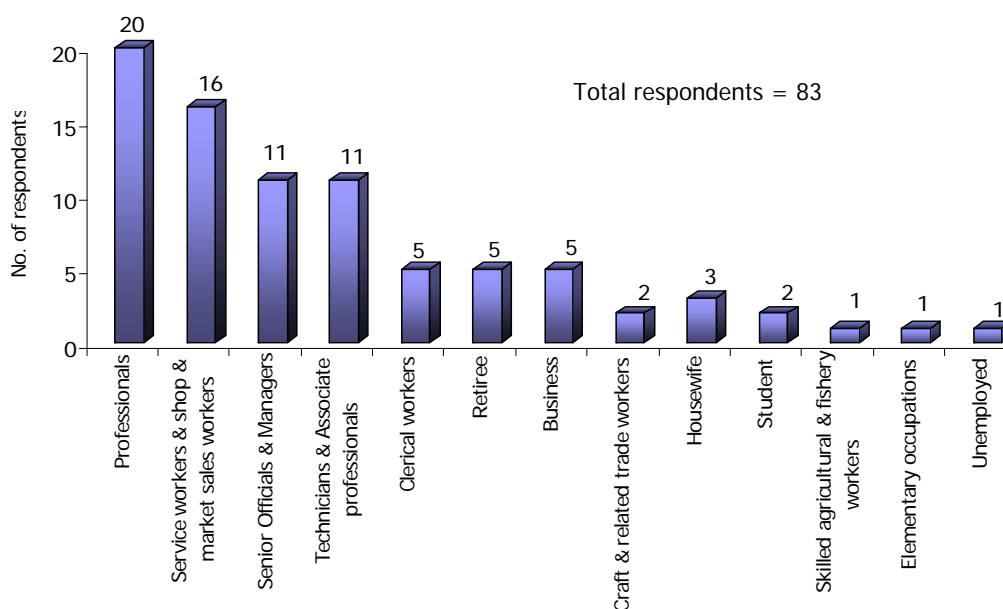
**Chart 2:** Preference for LRF among the different age groups



### 4.1.3 PREFERENCE FOR LRF AMONG THE DIFFERENT OCCUPATIONAL GROUPS

Major consumers of LRF were professionals, service and sales workers, senior officials and managers and those in the technical and associate professional occupational group. This may have direct correlation to the affordability of these more affluent groups.

**Chart 3:** Preference for LRF among different occupational groups



The above Occupational groups classification was based on Malaysia's Standard Classification of Occupations 1998 as interpreted in **Table 3**. Exception was made for the following categories - Retiree, Business, Housewife, Student and Unemployed - which were added in to facilitate the groupings. Respondents' actual occupations are listed in **Table 4** below:

**Table 3:** Malaysia's Standard Classification of Occupations 1998

- Professionals include graduate teaching professionals, accountants and auditors and computer designers and analysts
- Service workers and shop and market sales workers includes cooks, tourist guides and waiters
- Senior officials and managers include general managers, department managers and senior government officials
- Technicians and Associate Professionals include non-graduate teachers, supervisors and engineering and computer support technicians
- Clerical workers include administrative clerks, accounting and finance clerks and telephone operators
- Craft and related trade workers include mechanics and fitters, carpenters and tailors
- Skilled agricultural & fishery workers includes farm, plantation and forestry workers
- Elementary occupations include street vendors, domestic helpers and cleaners and construction and maintenance labourers

**Table 4:** Occupational group - Actual occupation of the respondents

<b>1</b>	<b>Senior Officials &amp; Managers</b>
	<i>CEO</i>
	<i>Director</i>
	<i>General Manager</i>
	<i>Manager</i>
<b>2</b>	<b>Professionals</b>
	<i>Airline professionals</i>
	<i>Architect</i>
	<i>Banker</i>
	<i>Consultant pharmacist</i>
	<i>Professional</i>
	<i>Doctor</i>
	<i>Engineers</i>
	<i>Finance</i>
	<i>Government Servant</i>
	<i>Internal auditor</i>
	<i>Land Surveyor</i>
	<i>Quantity Surveyor</i>
	<i>Graduate teachers</i>
<b>3</b>	<b>Technicians &amp; Associate professionals</b>
	<i>Account</i>
	<i>Credit Control</i>
	<i>Executive</i>
	<i>Marine supervisor</i>
	<i>Marketing Exec</i>
	<i>Research officer</i>
	<i>Teacher</i>
	<i>Technical Executive</i>
	<i>Telekom</i>
<b>4</b>	<b>Clerical workers</b>
	<i>Admin clerk</i>
	<i>Civil servant</i>
	<i>Officer</i>
<b>5</b>	<b>Service workers &amp; shop &amp; market sales workers</b>
	<i>Army</i>
	<i>Beautician</i>
	<i>Cook</i>
	<i>F&amp;B</i>
	<i>Medical sales</i>
	<i>Nurse</i>
	<i>Resort worker</i>
	<i>Sales</i>
	<i>Tourist Guide</i>



#### 4.1.4 REASON FOR LIKING TO EAT LRF

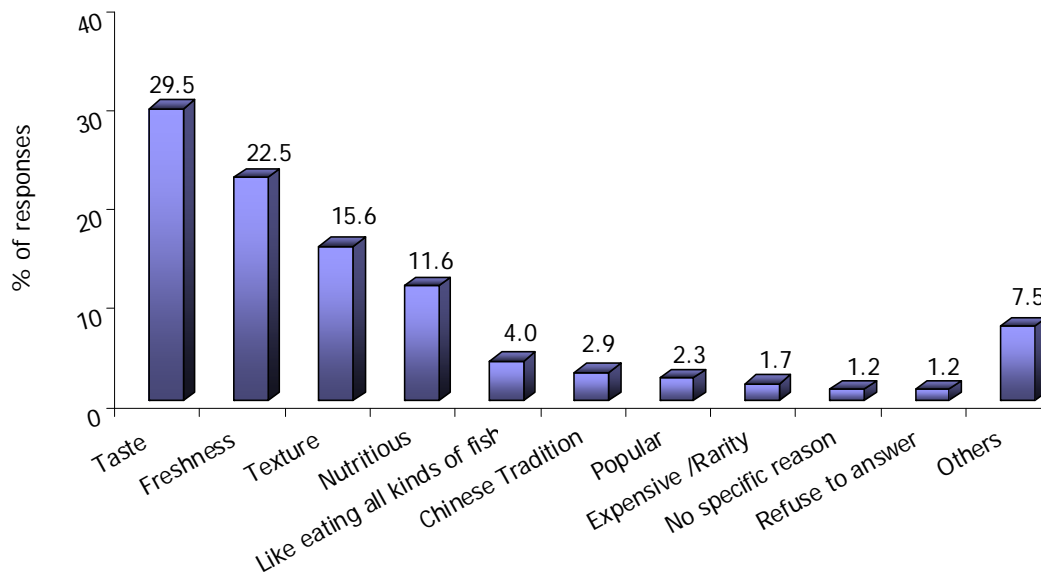
Respondents to this question exclude those who stated that they dislike eating LRF. The main reasons cited for respondents' preference were the LRF's good taste, which accounted for 29.5% of the total responses. This was followed by the freshness of the fish (22.5%), good texture (15.6%) and the fish's nutritional value (11.6%). In combined total, these four reasons made up 79.2% of the total responses.

**Table 5:** Reason for liking to eat LRF - quality

	Response	% of responses	% of respondents
Taste	51	29.5	56.7
Freshness	39	22.5	43.3
Texture	27	15.6	30.0
Nutritious	20	11.6	22.2
Like eating all kinds of fish	7	4.0	7.8
Chinese Tradition	5	2.9	5.6
Popular	4	2.3	4.4
Expensive /Rarity	3	1.7	3.3
No specific reason	2	1.2	2.2
Refuse to answer	2	1.2	2.2
Others*	13	7.5	14.4
<b>Total</b>	<b>173</b>	<b>100</b>	<b>192</b>
Total respondents : 90			

\* For other reasons for liking to eat LRF, see Table 6.

**Chart 4:** Reason for liking to eat LRF



**Table 6:** Reason for liking to eat LRF - Others

	<b>No. of Respondents</b>	<b>Percentage (%)</b>
Health reason - fish is healthier choice than meat	3	3
Balance diet (alternate with poultry/meat)	2	2
Less bony compared to fresh water fish	2	2
Reasonably priced	2	2
Used to eat fish	1	1
Natural	1	1
No muddy smell	1	1
No answer	1	1
<b>Total</b>	<b>13</b>	<b>13</b>

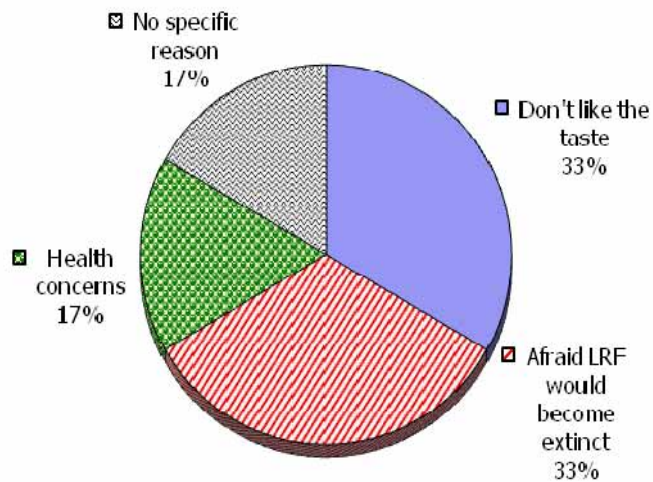
#### 4.1.5 REASON FOR DISLIKING TO EAT LRF

Respondents to this question were made up of those who dislike eating LRF. The main reasons stated by respondents who do not like eating LRF were the LRF's taste and the conservation of LRF.

**Table 7:** Reason for disliking to eat LRF

	Response	% of responses	% of respondents
Don't like the taste	2	33	33
Afraid LRF would become extinct	2	33	33
Health concerns	1	17	17
No specific reason	1	17	17
<b>Total</b>	<b>6</b>	<b>100</b>	<b>100</b>
Total respondents : 6			

**Chart 5:** Reason for disliking to eat LRF



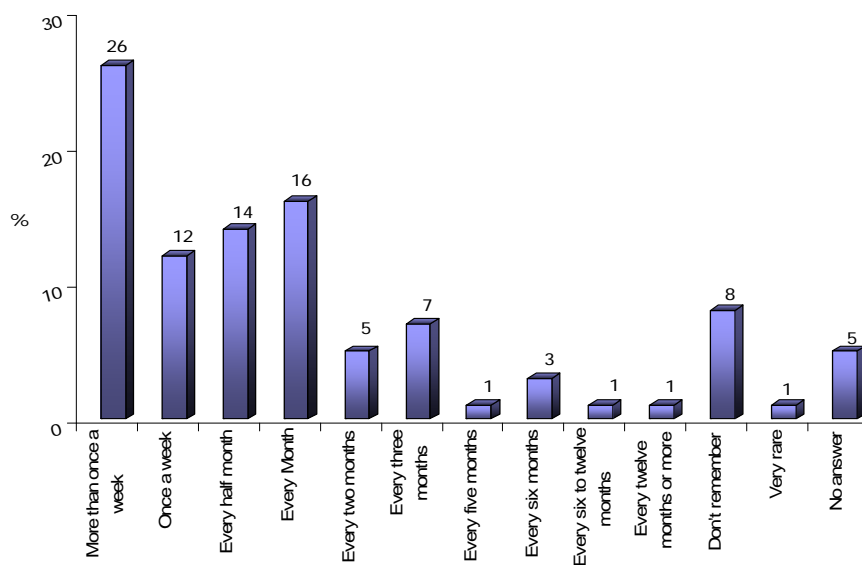
#### 4.1.6 FREQUENCY OF LRF CONSUMPTION

26% respondents consume LRF more than once a week. 16% eat LRF once every month while 14% eat LRF once every fortnight. 12% respondents eat LRF once a week.

**Table 8:** Frequency of LRF consumption

	No. of Respondents	Percentage (%)
More than once a week	26	26
Once a week	12	12
Every half month	14	14
Every Month	16	16
Every two months	5	5
Every three months	7	7
Every five months	1	1
Every six months	3	3
Every six to twelve months	1	1
Every twelve months or more	1	1
Don't remember	8	8
Very rare	1	1
No answer	5	5
<b>Total</b>	<b>100</b>	<b>100</b>

**Chart 6:** Frequency of LRF consumption

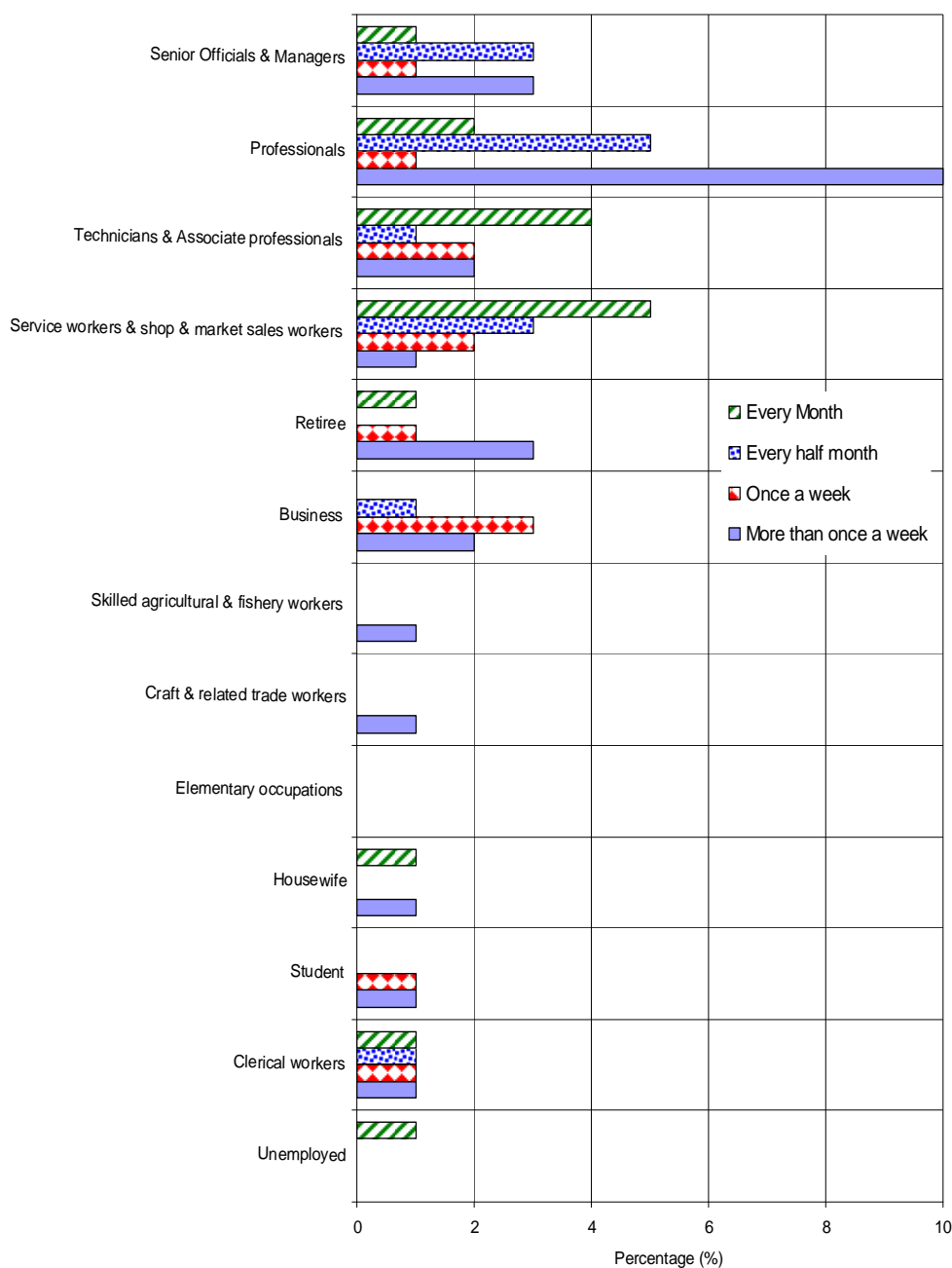


#### 4.1.7 FREQUENCY OF LRF CONSUMPTION AMONG DIFFERENT OCCUPATIONAL GROUPS

Professionals were the most frequent LRF consumer – 10% consuming LRF more than once a week. Other professions who consume LRF more than once a week were the Senior Officials and Managers (3%) and the Retirees (3%).

Cross-tabulation between the occupational groups and the occasion to eat LRF revealed that a higher percentage of the LRF consumption occurred during informal dinners than formal dinners. This statement applies to the Professional occupation group as well.

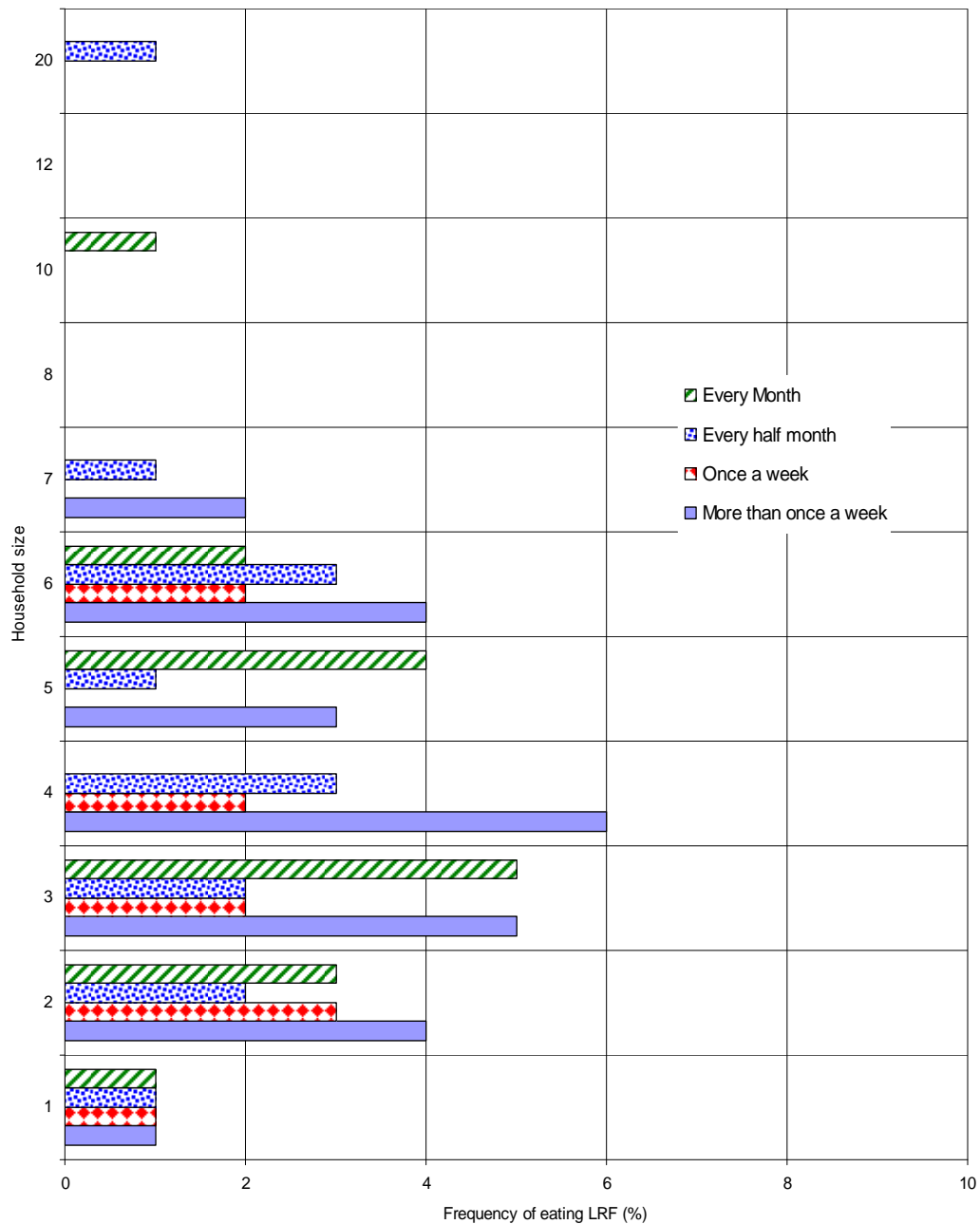
**Chart 7:** Frequency of LRF consumption among the different occupational group



#### 4.1.8 FREQUENCY OF LRF CONSUMPTION AMONG DIFFERENT HOUSEHOLD SIZE

Results revealed that respondents with household size between 2 and 6 were the biggest consumers of LRF.

**Chart 8:** Frequency of LRF consumption among the different household sizw



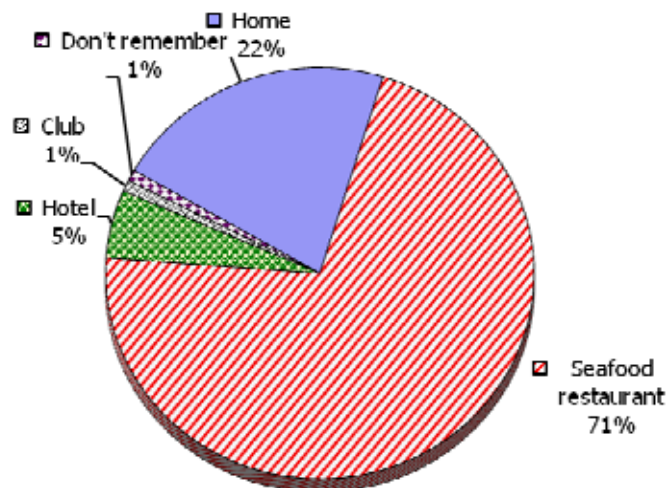
#### 4.1.9 VENUE OF CONSUMPTION

Seafood restaurants were the favourite venue for consumption of LRF, as indicated by 71.4% of the responses. 21.4% consume LRF at home. A small percentage of 5.4% ate LRF at hotels.

**Table 9:** Venue of consumption

Place of consumption	Response	% of responses	% of respondents
Home	24	21.4	25.3
Seafood restaurant	80	71.4	84.2
Hotel	6	5.4	6.3
Club	1	0.9	1.1
Don't remember	1	0.9	1.1
<b>Total</b>	<b>112</b>	<b>100</b>	<b>118</b>
Total respondents : 95			

**Chart 9:** Venue of consumption



#### 4.1.10 METHOD OF CHOOSING FISH

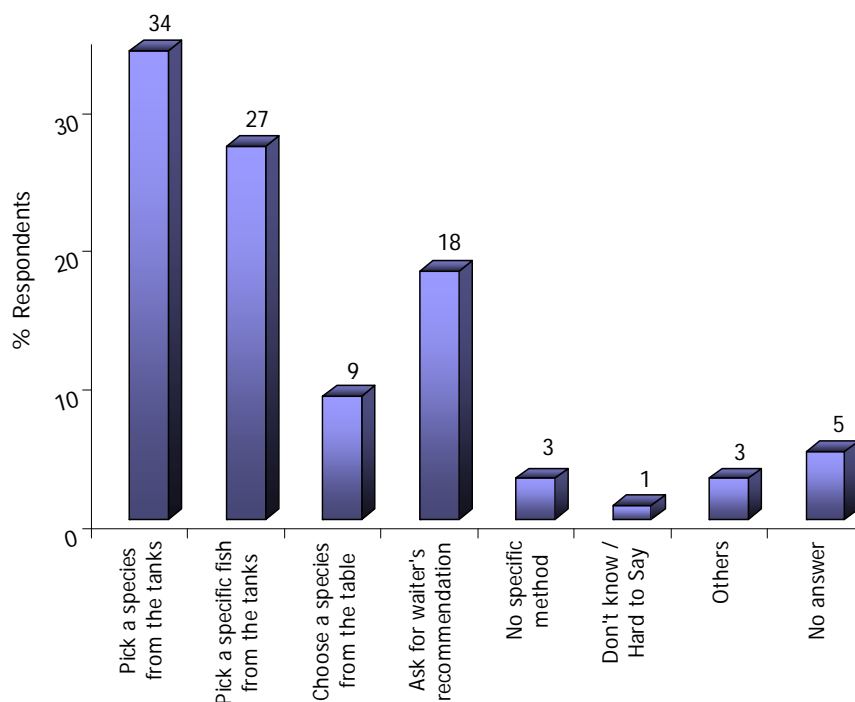
When dining in seafood restaurants, 34% respondents picked a species from the tanks, while 27% picked a specific fish from the tanks. 9% ordered their fish at the table from the menu. Combined, these three methods of choosing fish made up 70% of the total respondents, a clear indication that seafood restaurants' consumers were knowledgeable in choosing their fish.

On the other hand, 18% asked for the restaurant captains' recommendations.

**Table 10:** Method of choosing fish

Method of choosing fish	No. of respondents	Percentage (%)
Pick a species from the tanks	34	34
Pick a specific fish from the tanks	27	27
Choose a species from the table	9	9
Ask for waiter's recommendation	18	18
No specific method	3	3
Don't know / Hard to Say	1	1
Others	3	3
No answer	5	5
<b>Total</b>	<b>100</b>	<b>100</b>

**Chart 10:** Method of choosing fish





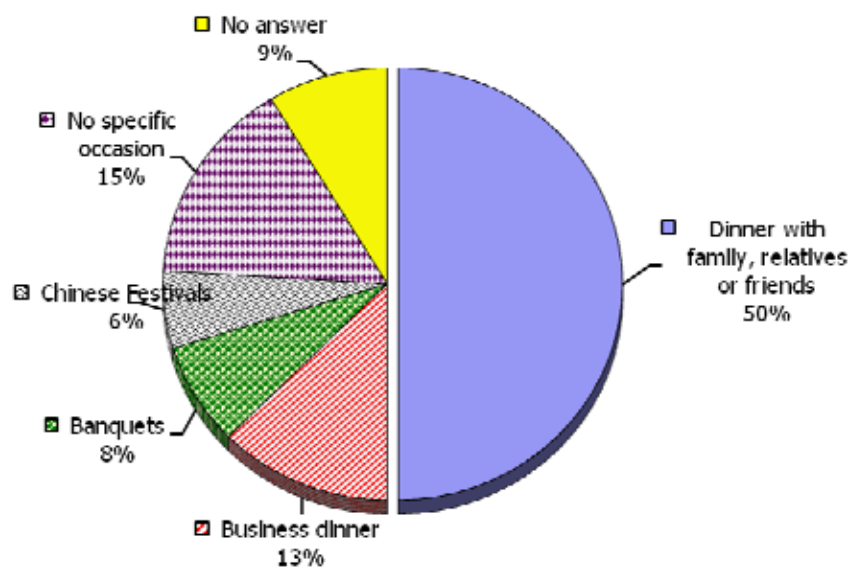
#### 4.1.11 OCCASION TO ORDER LRF

LRF was ordered mostly for occasions such as group dinners, business dinners and banquets. 50% respondents stated that they usually ordered LRF when dining with family or friends, 13% stated that LRF was ordered for business dinner and 8% stated that LRF was ordered for banquets such as weddings or birthdays.

**Table 11:** Occasion to order LRF

Occasion to order LRF	Response	% of responses	% of respondents
Dinner with family, relatives or friends	52	50	52
Business dinner	13	13	13
Banquets - Weddings, Birthdays	8	8	8
Chinese Festivals - CNY, Spring festival	6	6	6
No specific occasion (anytime)	16	15	16
No answer	9	9	9
<b>Total</b>	<b>104</b>	<b>100</b>	<b>104</b>
Total respondents : 100			

**Chart 11:** Occasion to order LRF



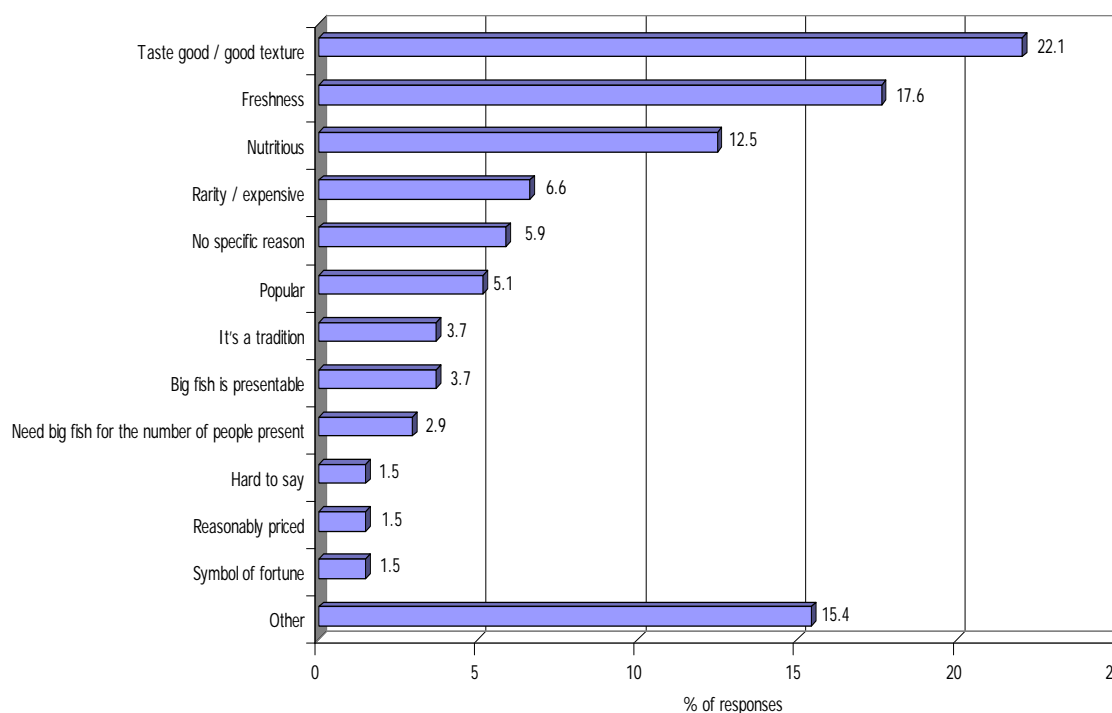
#### 4.1.12 MAIN REASONS FOR CONSUMING LRF IN VARIOUS OCCASIONS

Good taste and/or texture (22.1%), freshness (17.6%) and good nutritional value of the fish (12.5%) were quoted as the main reasons for choosing LRF for the various occasions.

**Table 12:** Main reasons for consuming LRF in various occasions

Reason for consumption	Response	% of	% of
Taste good / good texture	30	22.1	31.6
Freshness	24	17.6	25.3
Nutritious	17	12.5	17.9
Rarity / expensive	9	6.6	9.5
No specific reason	8	5.9	8.4
Popular	7	5.1	7.4
Big fish is presentable	5	3.7	5.3
It's a tradition	5	3.7	5.3
Need big fish for the number of people present	4	2.9	4.2
Symbol of fortune	2	1.5	2.1
Reasonably priced	2	1.5	2.1
Hard to say	2	1.5	2.1
Other	21	15.4	22.1
<b>Total</b>	<b>136</b>	<b>100</b>	<b>143</b>
Total respondents : 95			

**Chart 12:** Main reasons for consuming LRF in various occasions



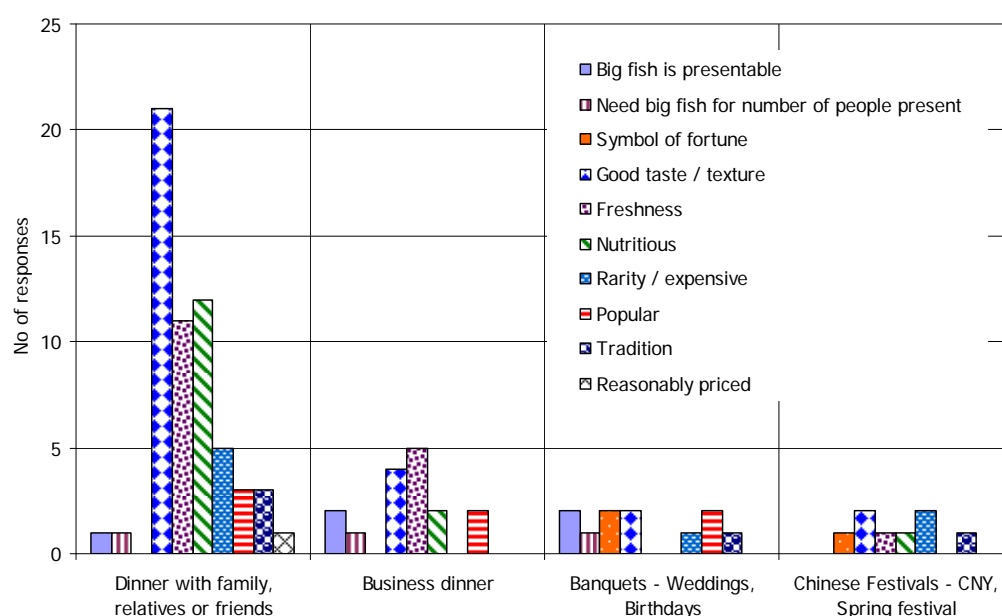
#### 4.1.13 MAIN REASONS FOR CONSUMING LRF ACCORDING TO DIFFERENT OCCASIONS

Reasons for ordering LRF varied according to the different occasions. For informal dinners, LRF was favoured for its good taste and texture, nutritional value and freshness. Formal business dinners emphasised on the freshness and good taste and texture of the LRF.

**Table 13:** Main reasons for consuming LRF according to different occasions

	Dinner family or friends	Business dinner	Banquets	Chinese Festivals	Total responses
Big fish is presentable	1	2	2	0	5
Need big fish for number of people present	1	1	1	0	3
Symbol of fortune	0	0	2	1	3
Good taste / texture	21	4	2	2	29
Freshness	11	5	0	1	17
Nutritious	12	2	0	1	15
Rarity / expensive	5	0	1	2	8
Popular	3	2	2	0	7
Tradition	3	0	1	1	5
Reasonably priced	1	0	0	0	1
<b>Total responses</b>	<b>58</b>	<b>16</b>	<b>11</b>	<b>8</b>	<b>93</b>

**Chart 13:** Main reasons for consuming LRF according to different occasions



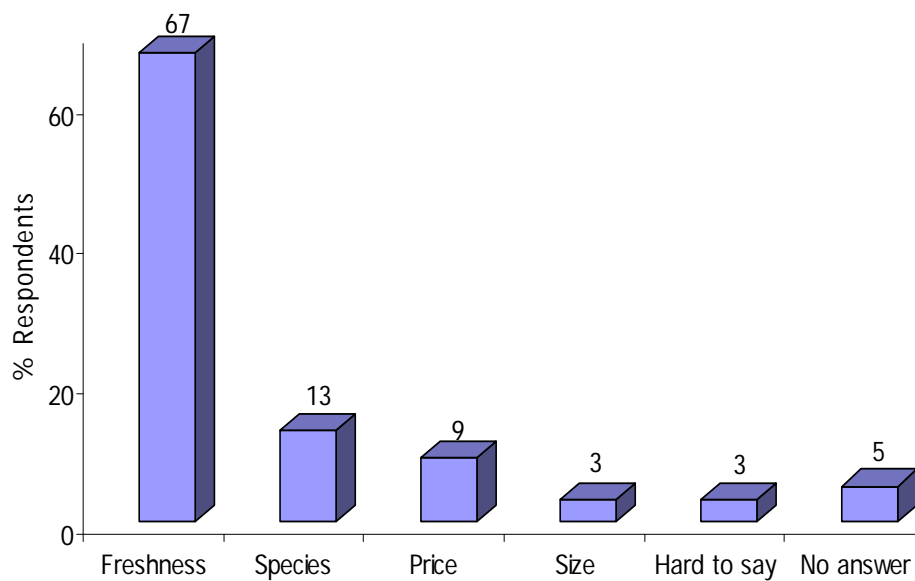
#### 4.1.14 IMPORTANT FACTOR CONSIDERED IN CHOOSING LRF

Freshness of fish was the most important factor considered by 67% respondents in choosing LRF. The second most important factor considered was the LRF species (13%), followed by the price (9%).

**Table 14:** Important factor considered in choosing LRF

	No. of respondents	Percentage (%)
Freshness	67	67
Species	13	13
Price	9	9
Size	3	3
Hard to say	3	3
No answer	5	5
<b>Total</b>	<b>100</b>	<b>100</b>

**Chart 14:** Important factor considered in choosing LRF



## 4.2 THE PREFERENCE ATTRIBUTES OF LRF

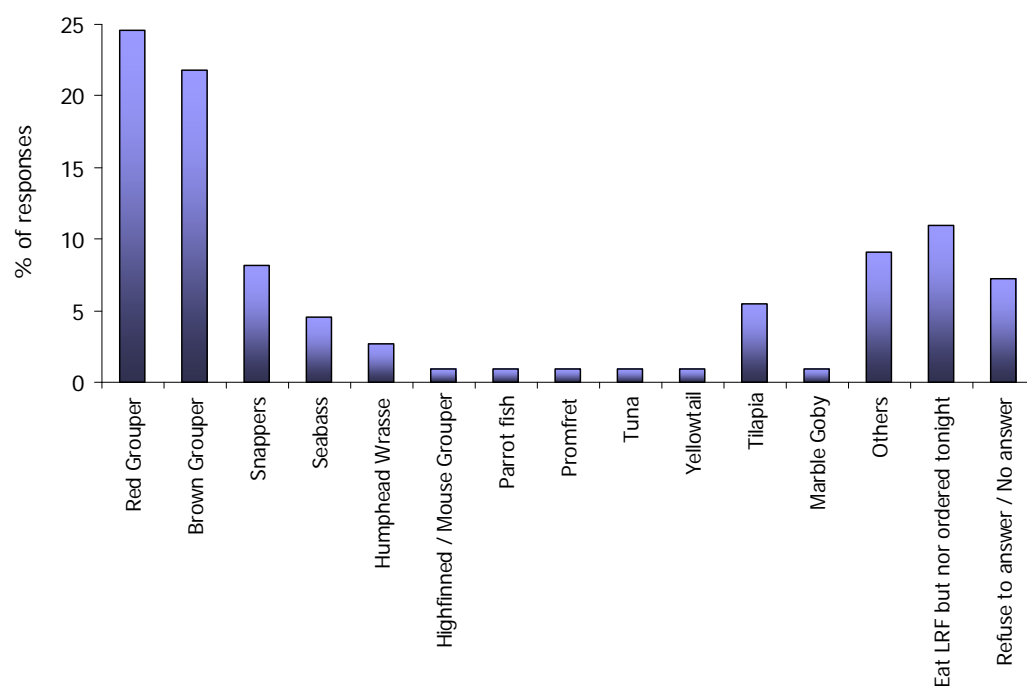
### 4.2.1 PREFERENCE FOR FISH SPECIES

The two most popular LRF ordered by respondents were the red groupers (24.5%) and brown groupers (21.8%).

**Table 15:** Preference for fish species

Species of Fish ordered	Response	% of responses	% of respondents
<b>MARINE FISH</b>			
Red Grouper	27	24.5	28.4
Brown Grouper	24	21.8	25.3
Snappers	9	8.2	9.5
Seabass	5	4.5	5.3
Humphead Wrasse	3	2.7	3.2
Mouse Grouper	1	0.9	1.1
Parrot fish	1	0.9	1.1
Pomfret	1	0.9	1.1
Tuna	1	0.9	1.1
Yellowtail	1	0.9	1.1
<i>Sub-Total</i>	<b>73</b>	<b>66.4</b>	<b>76.8</b>
<b>FRESHWATER FISH</b>			
Tilapia	6	5.5	6.3
Marble Goby	1	0.9	1.1
<i>Sub-Total</i>	<b>7</b>	<b>6.4</b>	<b>7.4</b>
<b>OTHERS</b>			
Others*	10	9.1	10.5
Eat LRF but not ordered tonight	12	10.9	12.6
Refuse to answer / No answer	8	7.3	8.4
<i>Sub-Total</i>	<b>30</b>	<b>27.3</b>	<b>31.6</b>
<b>Total</b>	<b>110</b>	<b>100</b>	<b>115.8</b>
Total respondents : 95			

**Chart 15:** Preference for fish species



**Table 16:** Preference for fish species – Others

Fish ordered - others	Response	% of responses	% of respondents
Not yet ordered at interview time	4	3.6	4.2
Not sure	2	1.8	2.1
Did not order any fish tonight	2	1.8	2.1
Prawn	1	0.9	1.1
Sliced fish	1	0.9	1.1
<b>Total</b>	<b>10</b>	<b>9.1</b>	<b>10.5</b>

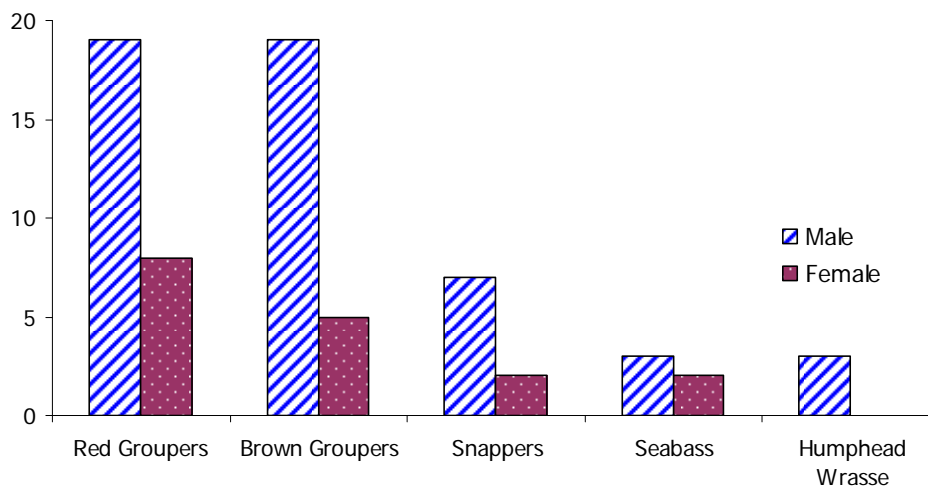
#### 4.2.2 PREFERENCE FOR POPULAR FISH SPECIES AMONG THE DIFFERENT SEXES

The five most popular marine fish species were predominantly ordered by males. This may be due to the fact that 73% of the respondents were male (Table 17).

**Table 17:** Preference for popular fish species among the different sexes

	Red Groupers	Brown Groupers	Snappers	Seabass	Humphead Wrasse
Male	19	19	7	3	3
Female	8	5	2	2	0
<b>Total responses</b>	<b>27</b>	<b>24</b>	<b>9</b>	<b>5</b>	<b>3</b>

**Chart 16:** Preference for popular fish species among the different sexes



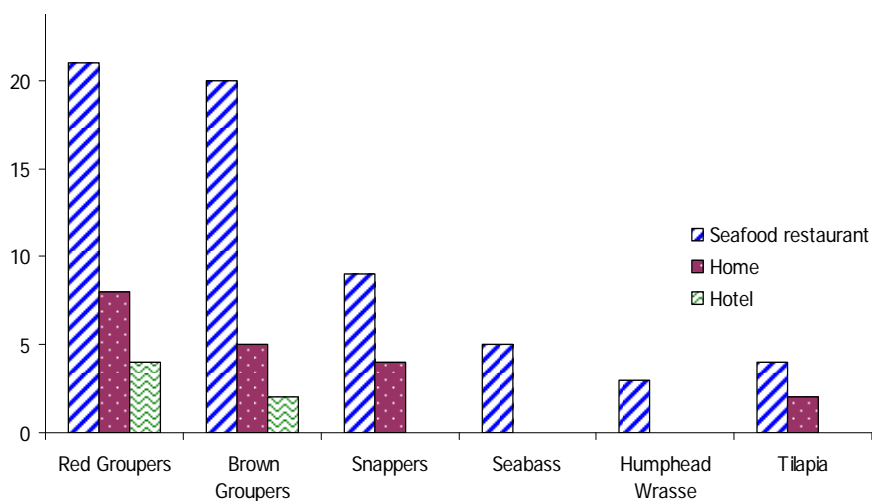
#### 4.2.3 PREFERRED VENUE OF CONSUMPTION FOR POPULAR FISH SPECIES

Seafood restaurants were manifestly the preferred venue for the consumption of popular fish species, compared to homes or hotels.

**Table 18:** Preferred venue of consumption for popular fish species

	Red Groupers	Brown Groupers	Snappers	Seabass	Humphead Wrasse	Tilapia
Seafood restaurant	21	20	9	5	3	4
Home	8	5	4	0	0	2
Hotel	4	2	0	0	0	0
<b>Total responses</b>	<b>33</b>	<b>27</b>	<b>13</b>	<b>5</b>	<b>3</b>	<b>6</b>

**Chart 17:** Preferred venue of consumption for popular fish specie





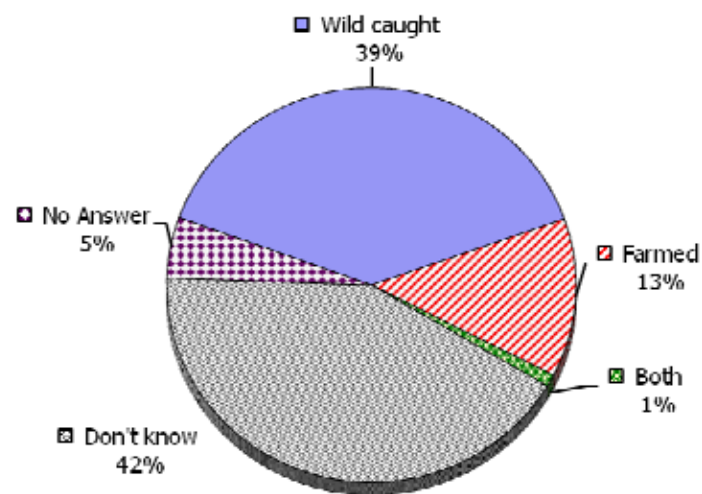
#### 4.2.4 PREFERENCE FOR SOURCE OF LRT

39% of fish ordered were wild-caught, while 13% were farmed. 42% respondents reported they have no idea whether their LRF was wild-caught or farmed.

**Table 19:** Source of LRF

	No. of Respondents	Percentage (%)
Wild-caught	39	39
Farmed	13	13
Both	1	1
Don't know	42	42
No Answer	5	5
<b>Total</b>	<b>100</b>	<b>100</b>

**Chart 18:** Source of LRF



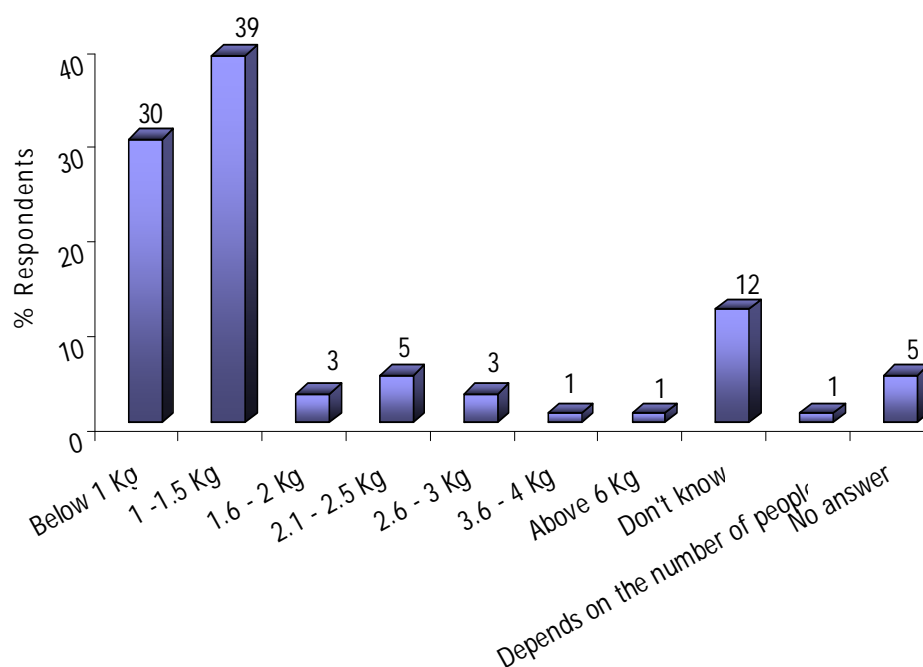
#### 4.2.5 PREFERENCE FOR LRF SIZE

The most common size of LRF ordered was between '1-1.5 kg' and 'below 1 kg', as related by 39% and 30% respondents respectively.

**Table 20:** Preference for LRF size

Weight	No. of respondents	Percentage (%)
Below 1 kg	30	30
1 -1.5 kg	39	39
1.6 - 2 kg	3	3
2.1 - 2.5 kg	5	5
2.6 - 3 kg	3	3
3.6 - 4 kg	1	1
Above 6 kg	1	1
Don't know	12	12
Depends on the number of people	1	1
No answer	5	5
<b>Total</b>	<b>100</b>	<b>100</b>

**Chart 19:** Preference for LRF size



#### 4.2.6

## PREFERENCE FOR LRF PRICE

Respondents preferred cheaper fish, with the favourite being those priced below RM50 per kg such as seabass. 26% respondents generally ordered LRF in this category.

21% usually order LRF priced between RM51-100 per kg such as the brown groupers and snappers. 17% respondents preferred LRF priced between RM101-150 per kg. LRF commonly found in this category includes red groupers. The number of respondents choosing higher priced LRF such as humphead wrasse and mouse grouper were minimal, accounting between 1-2% of the total respondents.

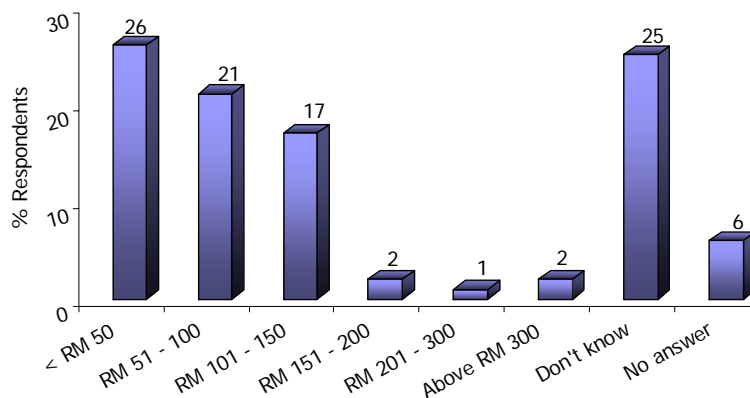
A high percentage of respondents (25%) did not know the average price of fish they ordered. This can be interpreted as either 1) these respondents were not the ones who usually order the fish, or 2) price was not a determining factor in choosing a fish.

**Table 21:** Preference for LRF Price

Ave. fish price per kg	No. of Respondents	Percentage (%)
< RM50	26	26
RM51 - 100	21	21
RM101 - 150	17	17
RM151 - 200	2	2
RM201 - 300	1	1
Above RM300	2	2
Don't know	25	25
No answer	6	6
<b>Total</b>	<b>100</b>	<b>100</b>

As a general guideline, the following was the average LRF price sold in seafood restaurants in and around Kota Kinabalu City.

**Chart 20:** Preference for LRF Price



**Table 22: Average LRF price sold by Kota Kinabalu's LRF restaurants in March 2006**

	<b>RM/kg</b>
Seabass	50
Snappers (red, mangrove, white, emperor)	60
Brown groupers (Greasy, Tiger)	60 – 90
Red groupers (Red coral trout / Sunuk)	120
Humphead wrasse (Mameng)	280
Mouse grouper	280
Marble Goby	120
Tilapia	40

Source : Port View Seafood and Ocean Seafood Restaurants

#### **4.2.7 PREFERENCE OF LRF PRICE AMONG DIFFERENT OCCUPATIONAL GROUP**

In general, professionals, technicians and associate professionals, service workers, skilled agricultural and fishery workers, retirees, housewives and students were the occupational groups that order fish below RM100 per kg.

Senior officials and managers tend to order higher priced fish above RM100 per kg. Cross-tabulation between LRF price and the occasion to order LRF revealed that the consumption of LRF was less associated with business functions, and more with informal functions such as dinners with family or friends. Hence, it can be concluded that those in this occupational group enjoy higher incomes that enable them to order higher priced fish.

### 4.3 CONSUMERS' ATTITUDE TOWARDS LRF CONSERVATION

#### 4.3.1 WILLINGNESS TO STOP OR REDUCE EATING VULNERABLE SPECIES

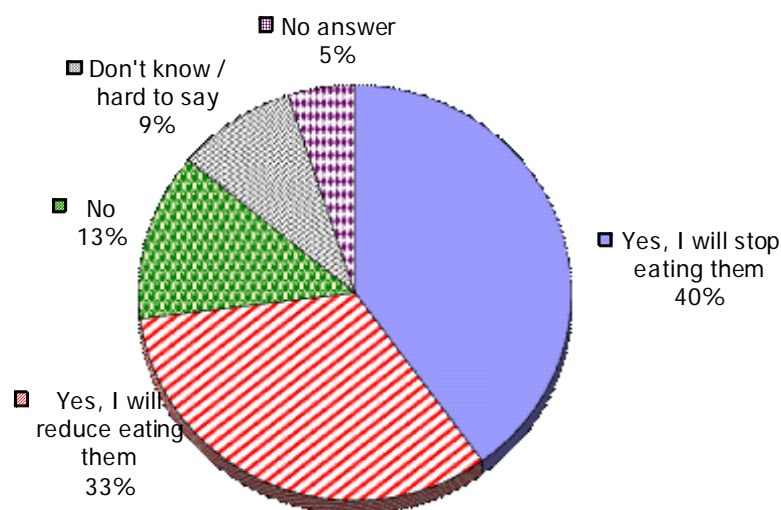
40% of respondents stated that if they knew that some fish species were threatened or decreasing in population, they would stop eating them. 33% stated that they would reduce eating them.

In contrast, 13% respondents stated that they would not stop or reduce eating vulnerable species.

**Table 23:** Willingness to stop or reduce eating vulnerable species

	No. of respondents	Percentage (%)
Yes, I will stop eating them	40	40
Yes, I will reduce eating them	33	33
No	13	13
Don't know / hard to say	9	9
No answer	5	5
<b>Total</b>	<b>100</b>	<b>100</b>

**Chart 21:** Willingness to stop or reduce eating vulnerable species



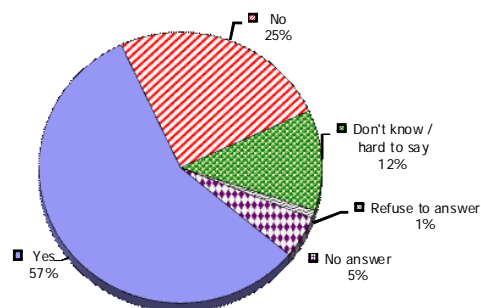
#### 4.3.2 SUPPORT FOR CONSERVATION BY REFUSING TO BUY THREATENED FISH SPECIES EVEN AFTER IT HAS BEEN CAUGHT

57% of respondents believed that by avoiding buying a threatened fish species, they could help conservation, while 25% respondents hold the opposite view.

**Table 24:** Support for conservation by refusing to buy threatened fish species

	No. of respondents	Percentage (%)
Yes	57	57
No	25	25
Don't know / hard to say	12	12
Refuse to answer	1	1
No answer	5	5
<b>Total</b>	<b>100</b>	<b>100</b>

**Chart 22:** Support for conservation by refusing to buy threatened fish species



#### 4.3.3 SUPPORT FOR CONSERVATION ACCORDING TO AGE GROUPS

The survey results revealed that respondents in the age bracket of 31-40 years old were the most supportive of conservation, both in terms of stopping or reducing consumption of vulnerable species and in refusing to purchase a threatened fish species (**Table 25** and **Table 26**)

**Table 25:** Support for conservation by reducing consumption - according to age groups

Age bracket	Yes, I will stop eating them	Yes, I will reduce eating them	No	Don't know / hard to say	Total
15-20	0	2	0	1	3
21-30	9	7	3	3	22
31-40	15	10	1	3	29
41-50	9	8	3	0	20
51-60	6	4	4	2	16
61 or above	1	2	2	0	5
<b>Total</b>	<b>40</b>	<b>33</b>	<b>13</b>	<b>9</b>	<b>95</b>

**Table 26:** Support for conservation by refusing to purchase threatened fish species - according to age groups

Age bracket	Yes	No	Don't know / hard to say	Refuse to answer	Total
15-20	3	0	0	0	3
21-30	12	7	3	0	22
31-40	19	5	5	0	29
41-50	12	4	3	1	20
51-60	8	8	0	0	16
61 or above	3	1	1	0	5
<b>Total</b>	<b>57</b>	<b>25</b>	<b>12</b>	<b>1</b>	<b>95</b>

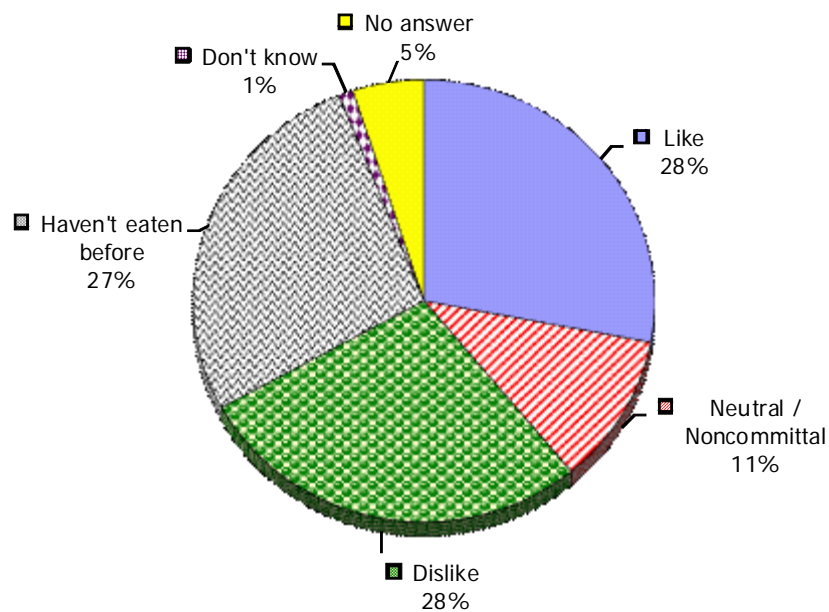
#### 4.3.4 PREFERENCE FOR HUMPHEAD WRASSE AND GIANT GROUPEr

Both humphead wrasse (HHW) and giant grouper (GG) are highly vulnerable to exploitation. Survey results revealed that 28% of respondents like to eat humphead wrasse / giant grouper, 28% dislike them and 11% were non-committal in their answers. 27% of respondents had never eaten neither species before.

**Table 27:** Preference for Humphead Wrasse and Giant Grouper

Preference for Humphead Wrasse / Giant Grouper	No. of Respondents	Percentage (%)
Like	28	28
Neutral / Noncommittal	11	11
Dislike	28	28
Haven't eaten before	27	27
Don't know	1	1
No answer	5	5
<b>Total</b>	<b>100</b>	<b>100</b>

**Chart 23:** Preference for Humphead Wrasse and Giant Grouper





#### 4.3.5 REASON FOR LIKING TO EAT HUMPHHEAD WRASSE AND/OR GIANT GROUPE

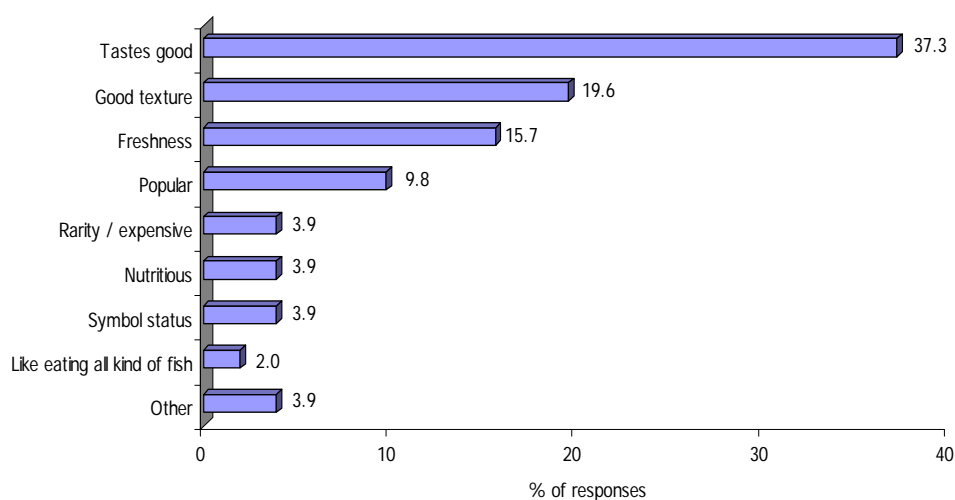
This section polled the rationale of the 28 respondents who like to eat humphead wrasse and/or giant grouper. There were two additional respondents, coming from the neutral / non-committal group, making a total of 30 respondents.

The main reasons for liking to eat humphead wrasse and/or giant grouper were, in descending order, the fish's good taste (37.3%), good texture (19.6%) and the freshness of the fish (15.7%).

**Table 28:** Reason for liking to eat humphead wrasse and/or giant grouper

Reason	Response	% of responses	% of respondents
Tastes good	19	37.3	63.3
Good texture	10	19.6	33.3
Freshness	8	15.7	26.7
Popular	5	9.8	16.7
Symbol status	2	3.9	6.7
Nutritious	2	3.9	6.7
Rarity / expensive	2	3.9	6.7
Like eating all kind of fish	1	2.0	3.3
Other than above	2	3.9	6.7
<b>Total</b>	<b>51</b>	<b>100</b>	<b>170</b>
Total Respondents : 30			

**Chart 24:** Reason for liking to eat humphead wrasse and/or giant grouper



#### 4.3.6 REASON FOR DISLIKING TO EAT HUMPHEAD WRASSE AND/OR GIANT GROUPER

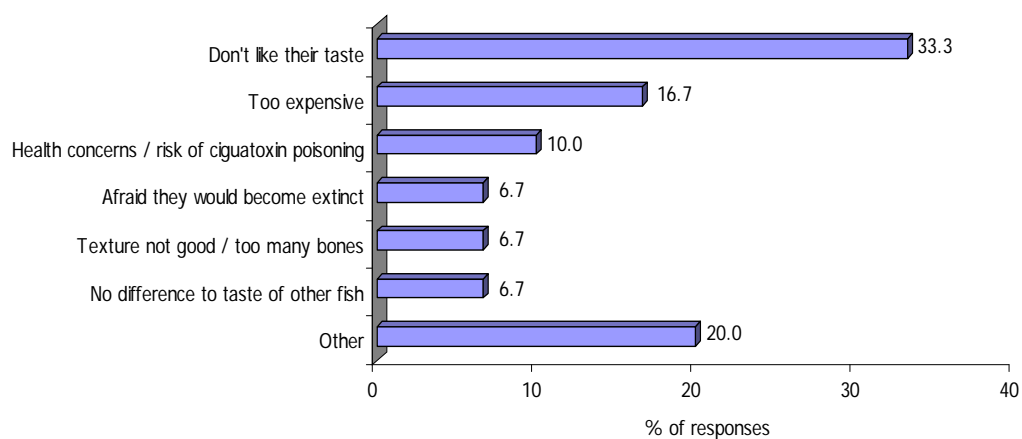
This section polled the rationale of the 28 respondents who disliked eating humphead wrasse and/or giant grouper.

Respondents' dislike were attributed to disliking the fish's taste (33.3%) and the fish's high price (16.7%)

**Table 29:** Reason for not liking to eat humphead wrasse and/or giant grouper

	Response	% of responses	% of respondents
Don't like their taste	10	33.3	35.7
Too expensive	5	16.7	17.9
Health concerns / risk of ciguatoxin poisoning	3	10.0	10.7
No difference to taste of other fish	2	6.7	7.1
Texture not good / too many bones	2	6.7	7.1
Afraid they would become extinct	2	6.7	7.1
Other*	6	20.0	21.4
<b>Total</b>	<b>30</b>	<b>100</b>	<b>107</b>
Total Respondents : 28			

**Chart 25:** Reason for not liking to eat humphead wrasse and/or giant grouper



**Table 30:** Reason for not liking to eat humphead wrasse and/or giant grouper - others

*Other reasons for disliking HHW/GG	Responses
Can't find in Taiwan - endangered fish	1
Never think of eating them	1
Don't look tasty	1
Looks ugly	1
They are not common	1
Too big	1
<b>Total</b>	<b>6</b>

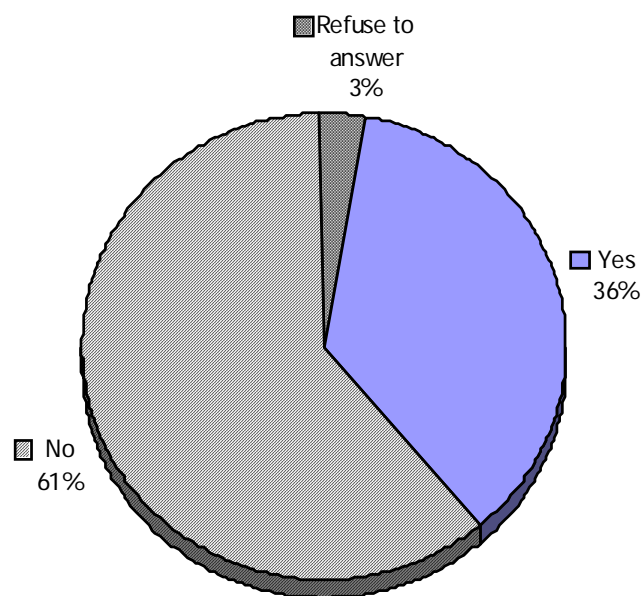
#### 4.3.7 AWARENESS THAT HUMPHHEAD WRASSE AND GIANT GROUPER ARE VULNERABLE SPECIES

Survey results revealed that a high percentage (61%) of the respondents did not know that humphead wrasse and giant grouper were vulnerable species. 36% of respondents, opportunely, were aware of this fact.

**Table 31:** Awareness that humphead wrasse and giant grouper were vulnerable species

	No. of Respondents	Percentage (%)
Yes	36	36
No	61	61
Refuse to answer	3	3
<b>Total</b>	<b>100</b>	<b>100</b>

**Chart 26:** Awareness that humphead wrasse and giant grouper are vulnerable species



## 4.4 AWARENESS OF DESTRUCTIVE FISHING METHODS

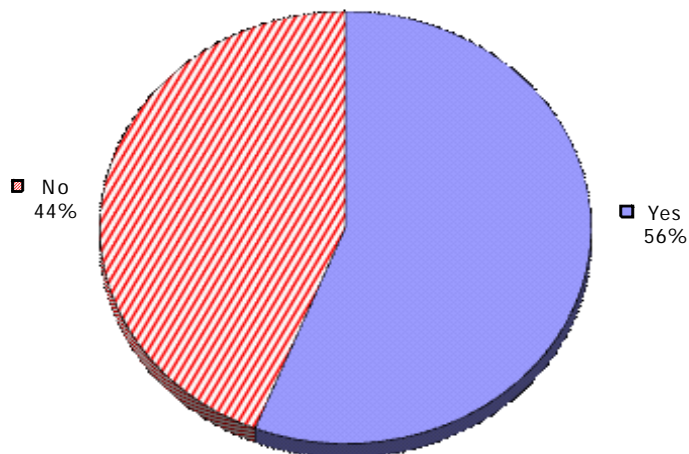
### 4.4.1 AWARENESS OF CYANIDE BEING USED IN CATCHING LRF

This survey revealed that 56% of respondents were aware of the use of cyanide as a method to catch fish. In contrast, 44% had never heard of this destructive fishing method

**Table 32:** Awareness of cyanide being used in catching LRF

	No. of Respondents	Percentage (%)
Yes	56	56
No	44	44
<b>Total</b>	<b>100</b>	<b>100</b>

**Chart 27:** Awareness of cyanide being used in catching LRF



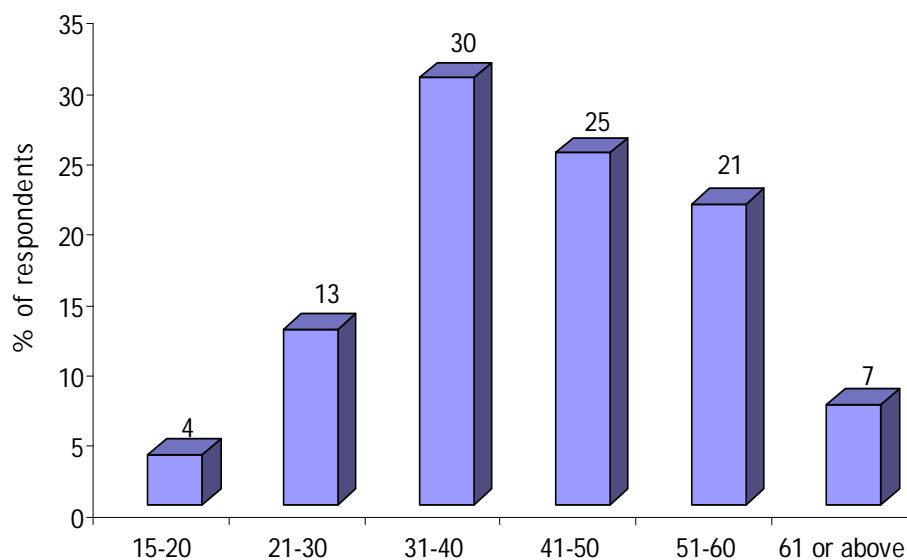
#### 4.4.2 AWARENESS OF CYANIDE BEING USED IN CATCHING LRF AMONG DIFFERENT AGE GROUPS

There was higher awareness of this destructive fishing method among respondents over 30 years of age. 30% of the respondents knowledgeable about cyanide fishing were in the 31-40 years age bracket. Another 25% was in the 41-50 years age bracket. 25% was in the 51-60 years old group.

**Table 33:** Awareness of cyanide being used in catching LRF among different age groups

Age bracket	No. of respondents	Percentage %
15-20	2	4
21-30	7	13
31-40	<b>17</b>	<b>30</b>
41-50	<b>14</b>	<b>25</b>
51-60	12	21
61 or above	4	7
<b>Total</b>	<b>56</b>	<b>100</b>

**Chart 28:** Awareness of cyanide being used in catching LRF among different age groups



#### 4.4.3 AWARENESS OF CYANIDE BEING USED IN CATCHING LRF AMONG DIFFERENT OCCUPATIONAL GROUPS

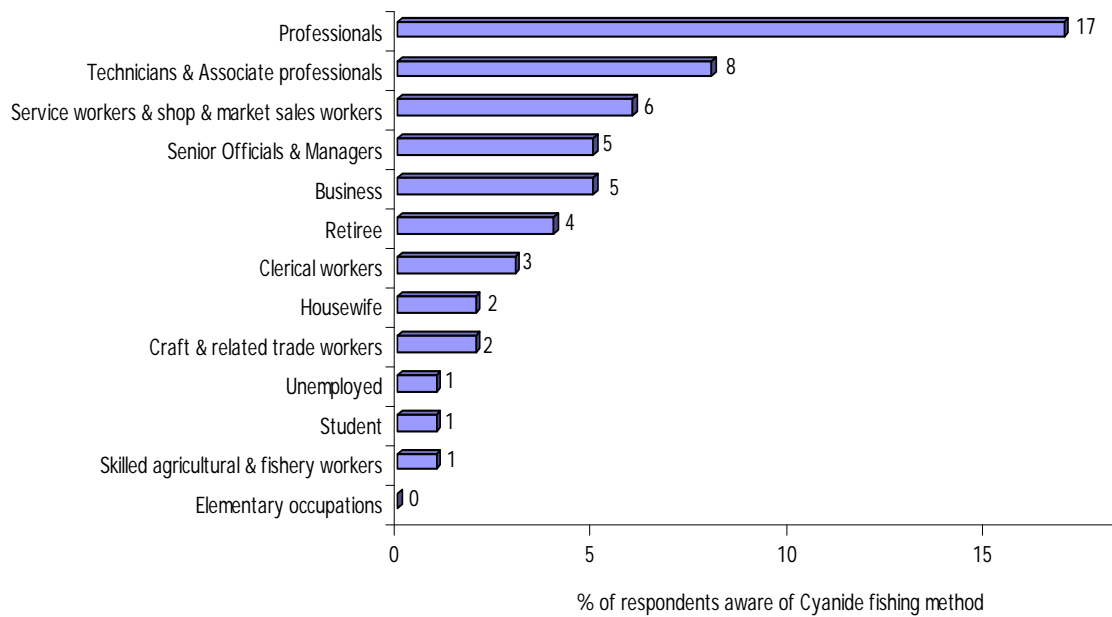
Awareness on cyanide fishing was visibly higher among the professionals compared to any other occupational group. Service workers, shop and market sales workers were the most uninformed about this destructive fishing method.

**Table 34:** Awareness of cyanide being used in catching LRF among different occupational groups

<b>Awareness on Cyanide fishing</b>	<b>Yes</b>	<b>No</b>	<b>Total</b>
Professionals	17	6	23
Technicians & Associate professionals	8	5	13
Service workers & shop & market sales workers	6	12	18
Business	5	2	7
Senior Officials & Managers	5	8	13
Retirees	4	1	5
Clerical workers	3	5	8
Craft & related trade workers	2	0	2
Housewives	2	2	4
Skilled agricultural & fishery workers	1	0	1
Students	1	1	2
Unemployed	1	0	1
Elementary occupations	0	1	1
<b>Total*</b>	<b>55</b>	<b>43</b>	<b>98</b>

\* Total respondents = 98. There were 1 respondent each from the Yes and the No category who didn't provide answer to their occupational group

**Chart 29:** Awareness of cyanide being used in catching LRF among different occupational groups



#### 4.4.4 KNOWLEDGE OF THE THREATS TO THE ENVIRONMENT POSED BY CYANIDE FISHING

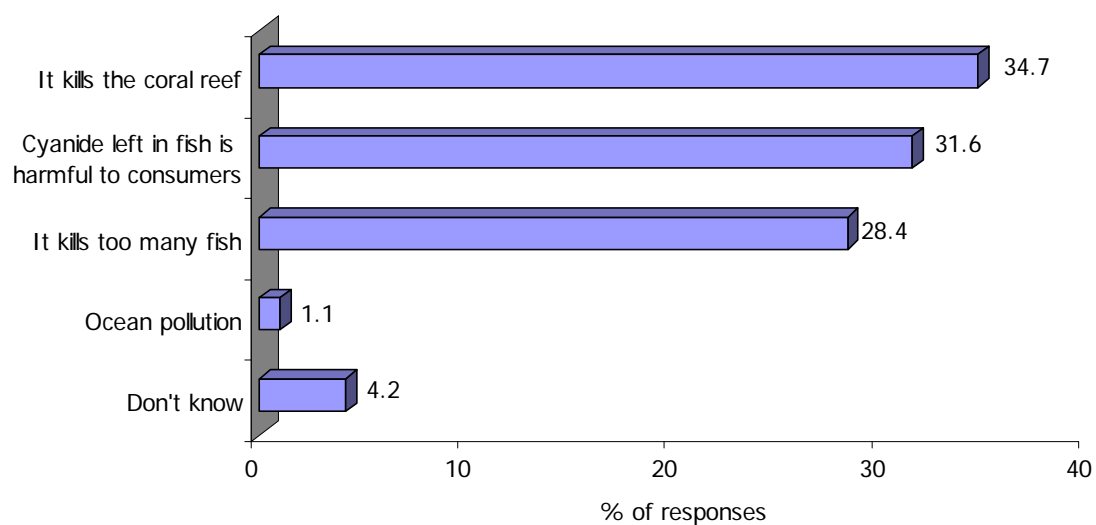
55 customers responded to this multiple answer question, yielding a total of 95 responses. 34.7% of the responses indicate respondents were aware that cyanide fishing is detrimental to the coral reef and 28.4% responses acknowledged the threats of cyanide fishing to the fish. Another 31.6% responses were concerned that cyanide left in fish is harmful to consumers.



**Table 35:** Knowledge of the threats to the environment posed by cyanide fishing

	Response	% of responses	% of respondents
It kills the coral reef	33	34.7	60.0
Cyanide left in fish is harmful to consumers	30	31.6	54.5
It kills too many fish	27	28.4	49.1
Ocean pollution	1	1.1	1.8
Don't know	4	4.2	7.3
<b>Total</b>	<b>95</b>	<b>100</b>	<b>173</b>
Total Respondents : 55			

**Chart 30:** Knowledge of the threats to the environment posed by cyanide fishing



## 4.5 CONSUMERS' ATTITUDE TOWARDS ALTERNATIVES

### 4.5.1 THE WILLINGNESS TO SUBSTITUTE WILD-CAUGHT LRF WITH FARMED REEF FISH OR FRESHWATER FISH

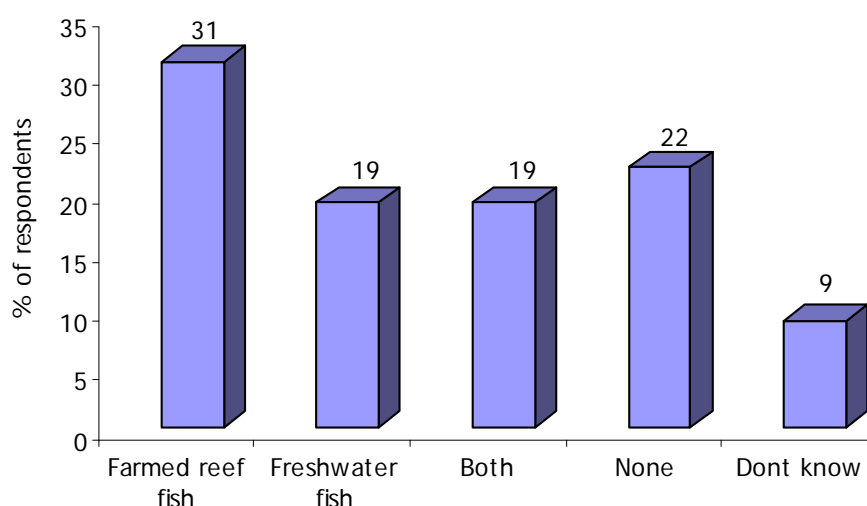
69% of the respondents were willing to eat farmed reef fish or freshwater fish as an alternative for wild-caught LRF. This included 31% who preferred farmed reef fish, 19% who preferred freshwater fish and 19% who will accept both farmed reef fish and freshwater fish.

On the contrary, 22% of respondents would not accept any alternative to wild-caught LRF.

**Table 36:** The willingness to substitute wild-caught LRF with farmed or freshwater fish

	No. of respondents	Percentage (%)
Farmed reef fish	31	31
Freshwater fish	19	19
Both	19	19
None	22	22
Don't know	9	9
<b>Total</b>	<b>100</b>	<b>100</b>

**Chart 31:** The willingness to substitute wild-caught LRF with farmed or freshwater fish



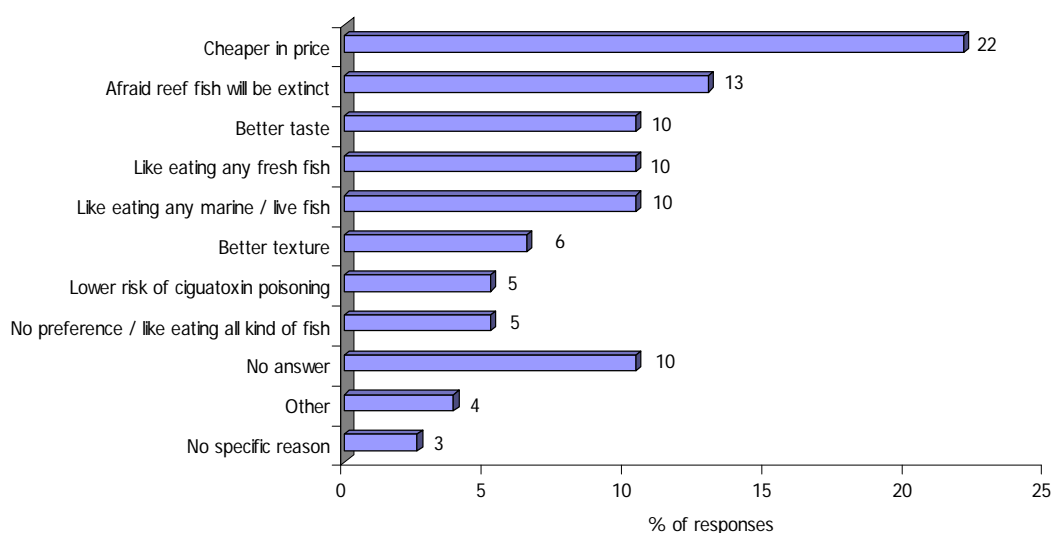
#### 4.5.2 UNDERLYING MOTIVATION FOR THE WILLINGNESS TO SUBSTITUTE WILD-CAUGHT LRF WITH FARMED REEF FISH OR FRESHWATER FISH

Factors triggering the changes in behaviour to substitute wild-caught LRF with farmed reef fish or freshwater fish were primarily the cheaper price of latter fish (22%), and the awareness towards the conservation of wild LRF (13%).

**Table 37:** Underlying motivation for the willingness to accept alternatives

	Response	% of responses	% of respondents
Cheaper in price	17	22	25
Afraid reef fish will be extinct	10	13	14
Better taste	8	10	12
Like eating any marine / live fish	8	10	12
Like eating any fresh fish	8	10	12
Better texture	5	6	7
No preference / like eating all kind of fish	4	5	6
Lower risk of ciguatoxin poisoning	4	5	6
No answer	8	10	12
Other	3	4	4
No specific reason	2	3	3
<b>Total</b>	<b>77</b>	<b>100</b>	<b>112</b>
Total respondents : 69			

**Chart 32:** Underlying motivation for the willingness to accept alternatives



#### 4.5.3 UNDERLYING MOTIVATION FOR THE REFUSAL TO SUBSTITUTE WILD-CAUGHT LRF WITH FARMED REEF FISH OR FRESHWATER FISH

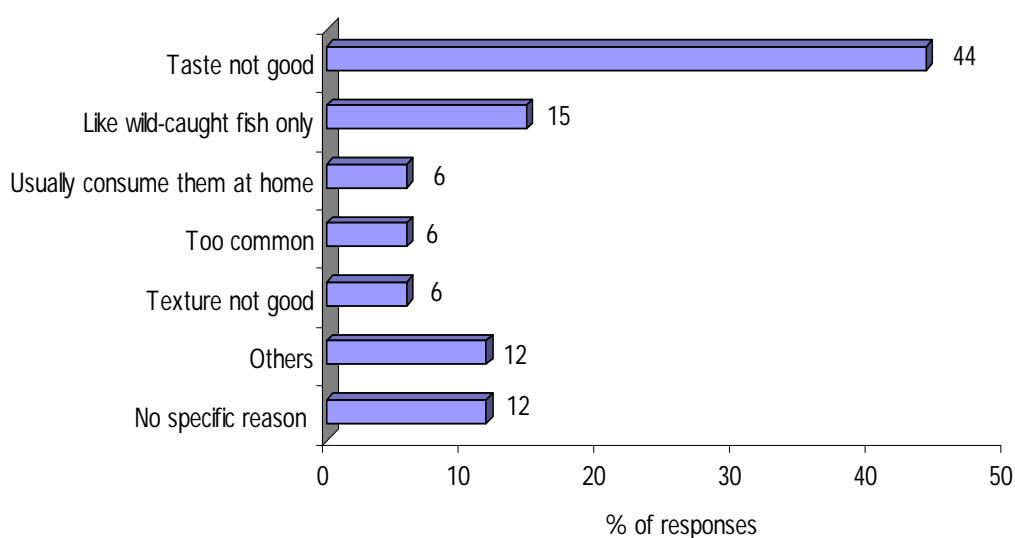
The inferior taste of the farm reef fish or freshwater fish to that of wild-caught LRF was the main reason quoted by 44% of the responses for refusing to accept these fish as alternatives to wild-caught LRF.

**Table 38:** Underlying motivation for the refusal to accept alternatives

	Response	% of responses	% of respondents
Taste not good	15	44	50
Like wild-caught fish only	5	15	17
Texture not good	2	6	7
Too common	2	6	7
Usually consume them at home	2	6	7
No specific reason	4	12	13
Others	4	12	13
<b>Total</b>	<b>34</b>	<b>100</b>	<b>113</b>
Total respondents : 30*			

\* 31 respondents stated refusal to accept alternatives. However, only 30 respondents gave their reasons while one respondent did not provide answer to this question.

**Chart 33:** Underlying motivation for the refusal to accept alternatives



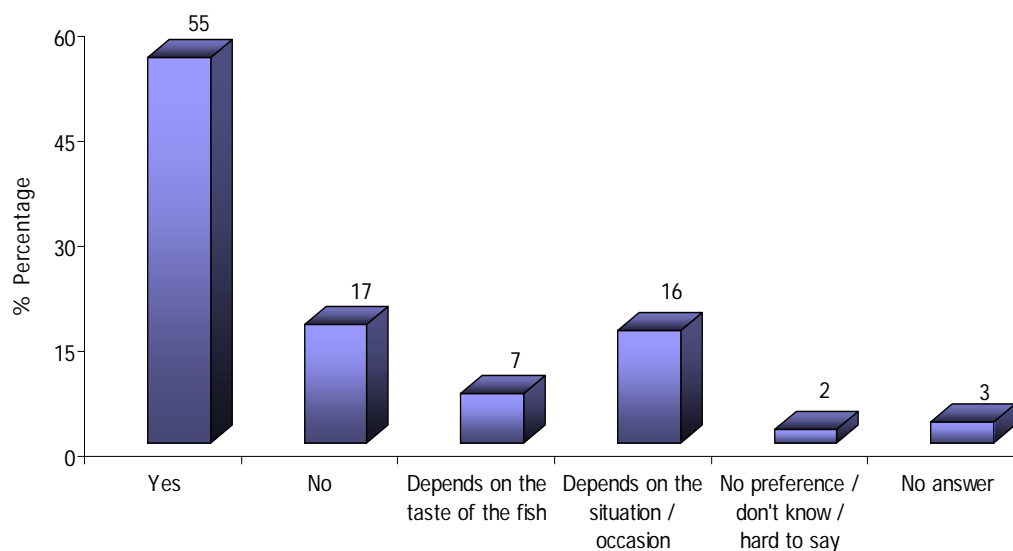
#### 4.5.4 WILLINGNESS TO EAT FARMED OR FRESHWATER FISH BECAUSE THEY ARE CHEAPER THAN WILD-CAUGHT LRF

55% of respondents were willing to switch to farmed reef fish or freshwater fish if these fish were cheaper than wild-caught LRF. Nevertheless, 17% still preferred wild-caught LRF despite their higher prices. Survey results also revealed that price was a determining factor in consumers' attitude towards alternatives, 16% and 7% respectively stated that their decision to change their consumption pattern was influenced by the situation/occasion and the taste of the fish.

**Table 39:** Willingness to accept alternatives because they are cheaper than wild-caught LRF

	No. of Respondents	Percentage (%)
Yes	55	55
No	17	17
Depends on the taste of the fish	7	7
Depends on the situation / occasion	16	16
No preference / don't know / hard to say	2	2
No answer	3	3
Total	100	100

**Chart 34:** Willingness to accept alternatives because they are cheaper than wild-caught LRF



## 4.6 DEMOGRAPHICS

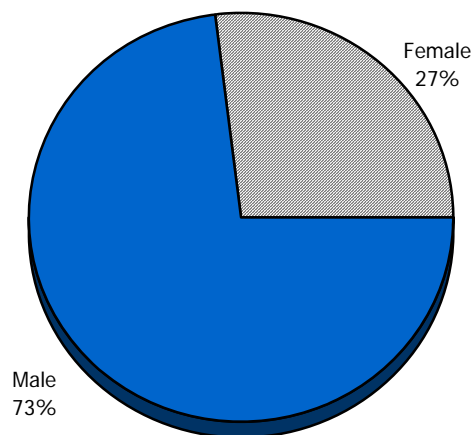
### 4.6.1 GENDER

73% of the respondents were male and the remaining 27% were female.

Table 40: Gender

Sex	No. of Respondents	Percentage (%)
Male	73	73
Female	27	27
Total	100	100

Chart 35: Gender



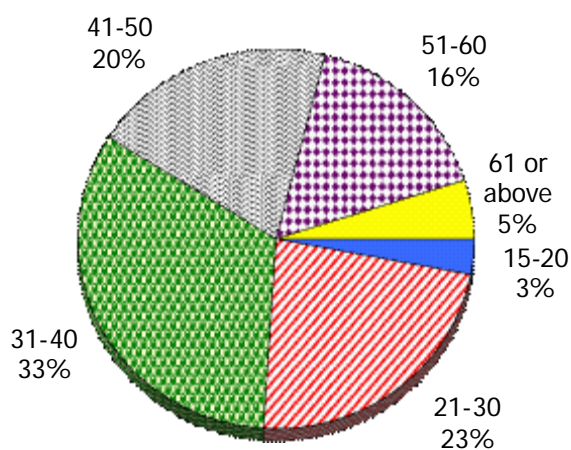
### 4.6.2 AGE GROUP

The biggest group of respondents were those aged 31-40 years, comprising 33% of the total respondents. The second biggest group, accounting for 23% of the total respondents, was represented by respondents aged 21-30 years. These two groups were followed by those in the age group 41-50 years, representing 20% of the total.

**Table 41: Age Group**

Age group	No. of Respondents	Percentage (%)
15-20	3	3
21-30	23	23
31-40	33	33
41-50	20	20
51-60	16	16
61 or above	5	5
Total	100	100

**Chart 36: Age Group**



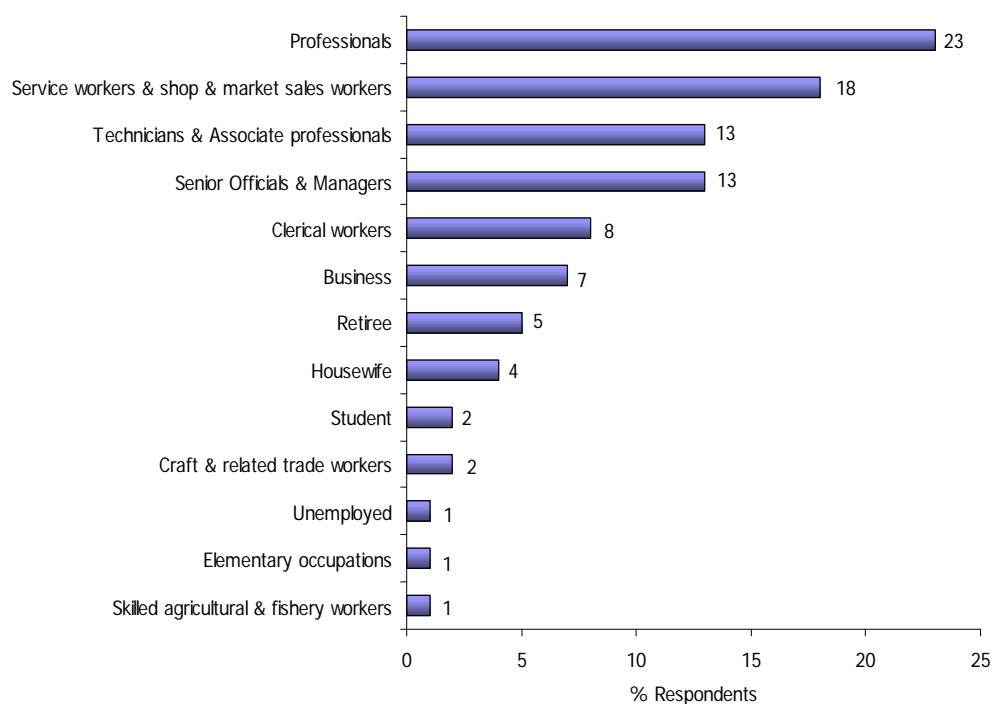
#### 4.6.3 OCCUPATIONAL GROUP

The majority of respondents (23%) were in the professional group. This was followed by service workers, shop and market sales workers. Senior officials and managers, and technicians and associate professionals each made up 13% of the total.

**Table 42: Occupational Group**

Occupational Group	No. of Respondents	Percentage (%)
Professionals	23	23
Service workers & shop & market sales workers	18	18
Senior Officials & Managers	13	13
Technicians & Associate professionals	13	13
Clerical workers	8	8
Business	7	7
Retirees	5	5
Housewives	4	4
Craft & related trade workers	2	2
Students	2	2
Skilled agricultural & fishery workers	1	1
Elementary occupations	1	1
Unemployed	1	1
No answer	2	2
<b>Total</b>	<b>100</b>	<b>100</b>

**Chart 37: Occupational Group**





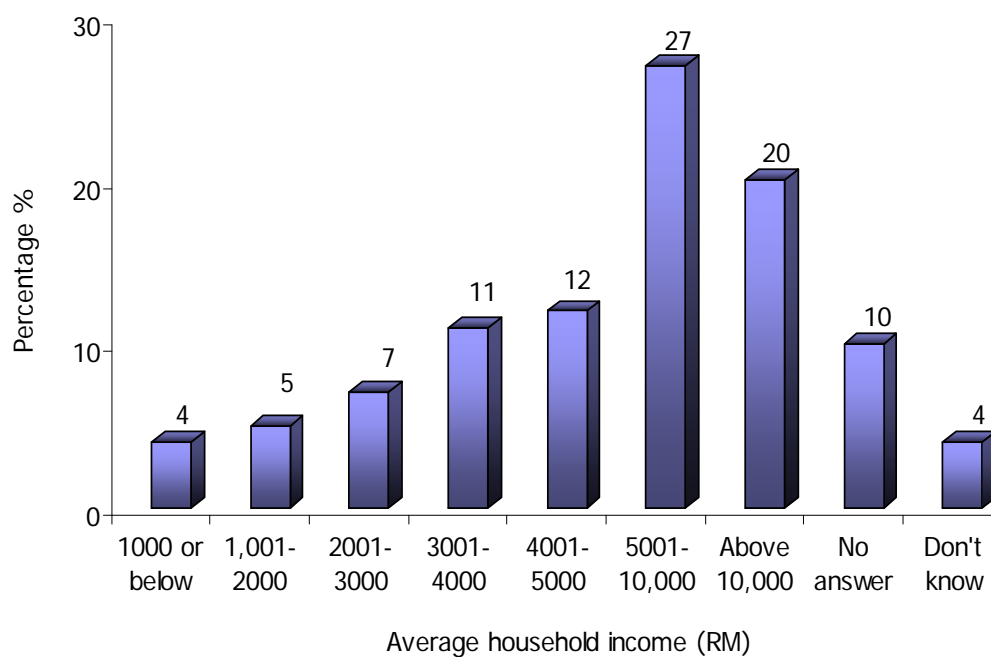
#### 4.6.4. AVERAGE HOUSEHOLD INCOME

27% of respondents had household incomes of RM5001-10,000. 20% had household incomes of above RM10,000. Lower on the pay scale, 12% earned household incomes of RM4001-5000, while 11% earned between RM3001-4000.

**Table 43:** Average household income

	No. of Respondents	Percentage (%)
1000 or below	4	4
1,001-2000	5	5
2001-3000	7	7
3001-4000	11	11
4001-5000	12	12
5001-10,000	27	27
Above 10,000	20	20
No answer	10	10
Don't know	4	4
Total	100	100

**Chart 38:** Average household income



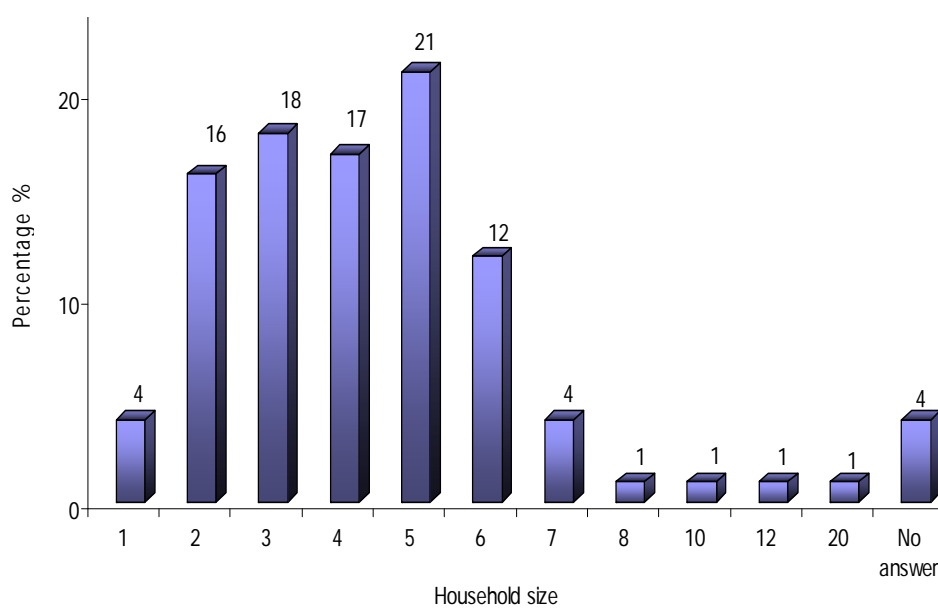
#### 4.6.5 AVERAGE HOUSEHOLD SIZE

The majority of respondents (21%) had a household size of 5 persons. 18% respondents had household sizes of three persons, 17% had families of four while 16% households were made up of two persons.

**Table 44:** Average household size

Household number	No. of Respondents	Percentage (%)
1	4	4
2	16	16
3	18	18
4	17	17
5	21	21
6	12	12
7	4	4
8	1	1
10	1	1
12	1	1
20	1	1
No answer	4	4
<b>Total</b>	<b>100</b>	<b>100</b>

**Chart 39:** Average household size



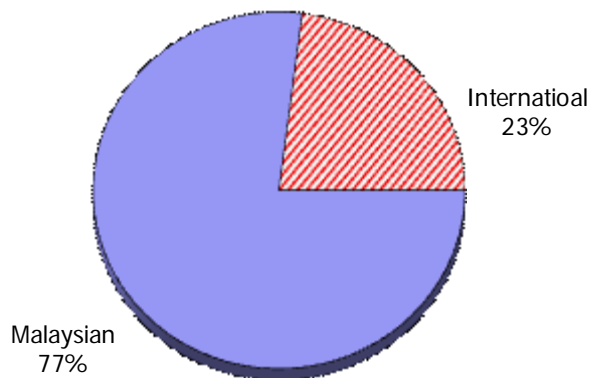
#### 4.6.6 NATIONALITY

77% of the respondents were Malaysians, while the remaining 23% were international tourists. Of the 23% international tourists, Hong Kong tourists made up the largest percentage (9%), while China tourists were 4% of the total respondents. Of the 77% Malaysians interviewed, Sabahans made up the largest number of respondents with 43%. Peninsular Malaysia made up 28%, while Sarawak made up 4%.

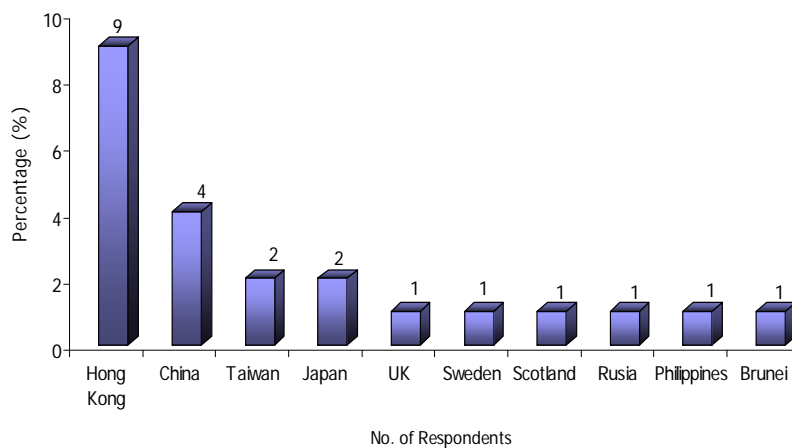
**Table 45: Nationality**

Nationality	No. of respondents	Percentage (%)
Malaysian	77	77
International	23	23
<b>Total</b>	<b>100</b>	<b>100</b>

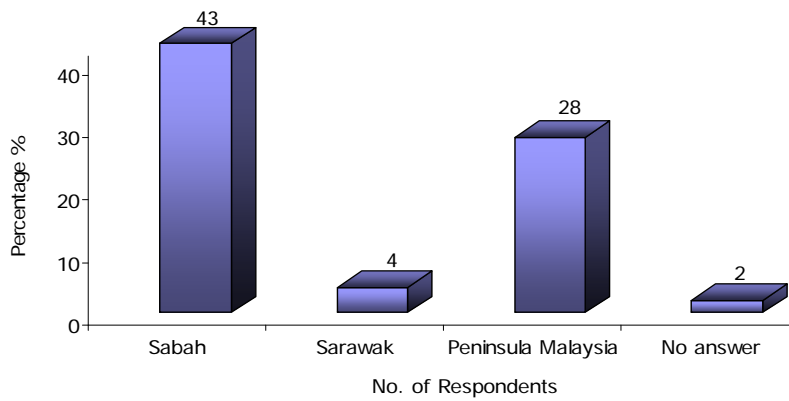
**Chart 40: Nationality**



**Chart 41: International Nationality**



**Chart 42 : Malaysian-place of origin**



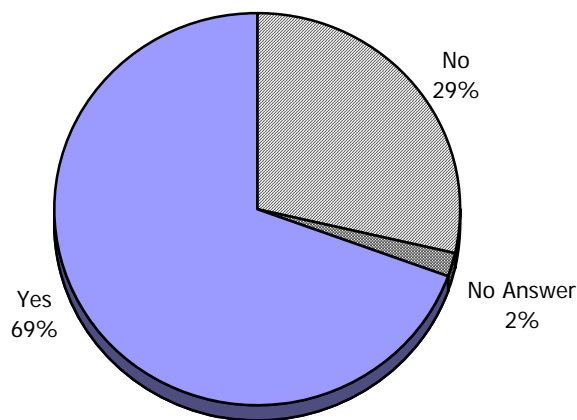
**4.6.7 KNOWLEDGE OF LRF IN SABAH RESTAURANTS**

Of the 49 respondents who answered this question, 69% indicated that they had prior knowledge that LRF were sold in seafood restaurants in Sabah. 29% indicated otherwise.

**Table 46: Knowledge of LRF in Sabah restaurants**

	No. of Respondents	Percentage (%)
Yes	34	69
No	14	29
No Answer	1	2
<b>Total</b>	<b>49</b>	<b>100</b>

**Chart 43: Knowledge of LRF in Sabah restaurants**



## PART TWO: RESTAURANT MANAGER ATTITUDE SURVEY IN KOTA KINABALU

### 5. SURVEY RESULTS – RESTAURANT MANAGERS

#### 5.1 IDENTIFICATION OF LRF SOLD IN SEAFOOD RESTAURANTS

##### 5.1.1 SPECIES

Eight (8) seafood restaurants participated in the Restaurant Manager Attitude Survey.

All eight restaurants offered live reef fish (LRF) on their menu. Popular live reef fish sold were brown, red and giant groupers, humphead wrasse, mouse grouper, snappers and seabass.

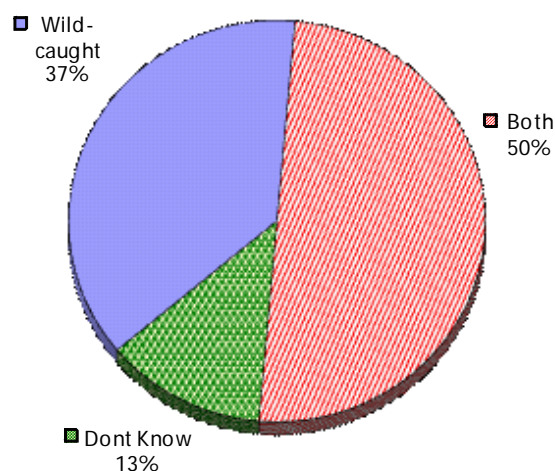
##### 5.1.2 SOURCE

38% of the restaurant managers reported that LRF sold in their restaurants were wild-caught, while 50% reported that they sold both wild-caught and farmed reef fish.

**Table 47:** Seafood restaurants - source of LRF

	No. of Respondents	Percentage (%)
Wild-caught	3	38
Both	4	50
Don't Know	1	13
<b>Total</b>	<b>8</b>	<b>100</b>

**Chart 44:** Seafood restaurants - source of LRF



## 5.2 RESTAURANT MANAGERS' ATTITUDE TOWARDS LRF CONSERVATION

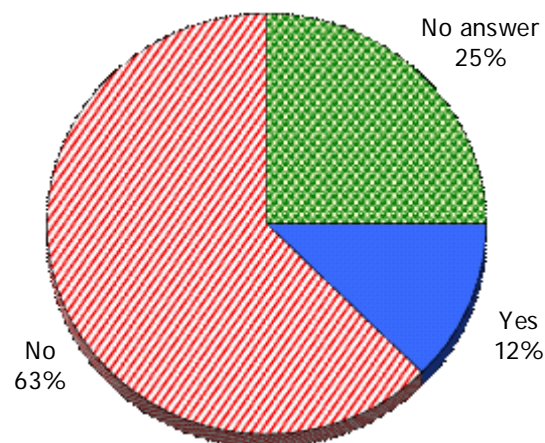
### 5.2.1 ATTITUDE TOWARDS PURCHASING SMALL-SIZED AND IMMATURE LRF

63% of restaurant managers announced that they were against the purchase of very small-sized and immature LRFs. On the other hand, 13% were not against this practice. 25% restaurant managers refused to answer this question.

**Table 48:** Attitude towards purchasing small-sized and immature LRF

	No. of Respondents	Percentage (%)
Yes	1	13
No	5	63
No answer	2	25
<b>Total</b>	<b>8</b>	<b>100</b>

**Chart 45:** Attitude towards purchasing small-sized and immature LRF



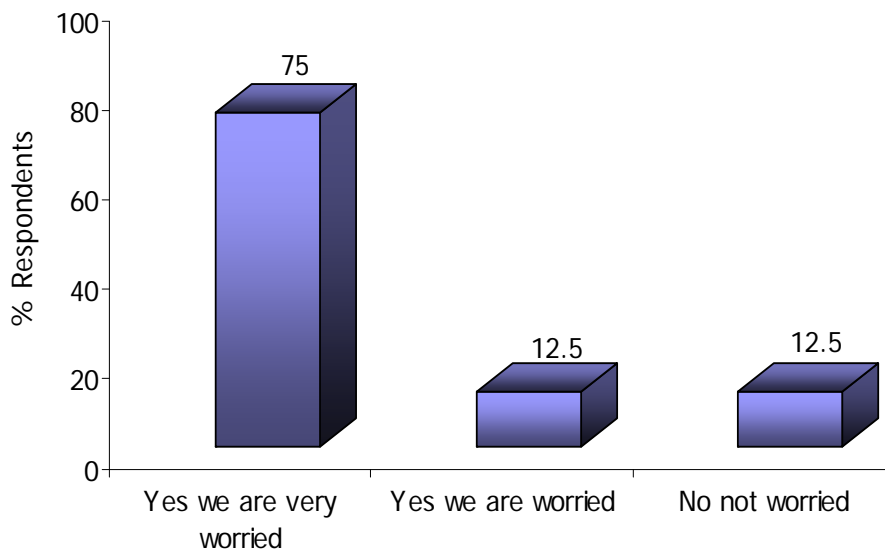
### 5.2.2 ATTITUDE TOWARDS THE DECREASING NUMBERS OF LRF

Seven out of eight (87.5%) of the restaurant managers expressed their concern over the sustainability of the trade, noting the possibility of decreasing LRF supply in the future due to unsustainable harvesting practices. One restaurant manager (12.5%) was indifferent.

**Table 49:** Concern over decreasing LRF supply

	No. of Respondents	Percentage (%)
Yes we are very worried	6	75
Yes we are worried	1	12.5
No not worried	1	12.5
<b>Total</b>	<b>8</b>	<b>100</b>

**Chart 46:** Concern over decreasing LRF supply



### 5.2.3 ATTITUDE TOWARDS MEASURES TO ADDRESS THE DECREASING NUMBERS OF LRF

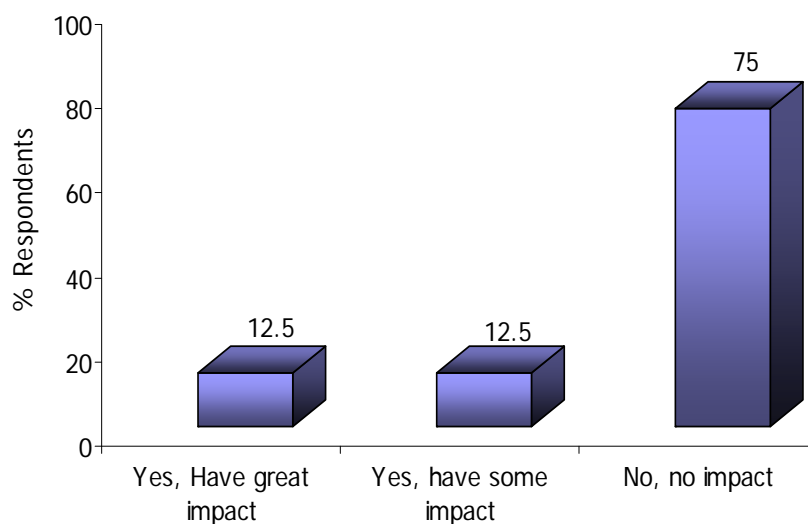
#### i) Establishment of minimum size limits for LRF catches or import/ sales ban of LRF species

Six out of eight (75%) restaurant managers believed that there would be no impact on their business if the Sabah Government imposed size limits on LRF catches and on imports of LRF into the state. Only two managers (25%) were worried that these moves would have impact on their business. Nevertheless, all eight managers stated that they will support conservation measures to promote sustainable fisheries, such as imposing size limits on LRF catches and on LRF imports into Sabah.

**Table 50:** Impact of size limits on LRF catches and imports on the trade

	No of Respondents	Percentage (%)
Yes, Have great impact	1	12.5
Yes, have some impact	1	12.5
No, no impact	6	75
<b>Total</b>	<b>8</b>	<b>100</b>

**Chart 47:** Impact of size limits on LRF catches and imports on the trade





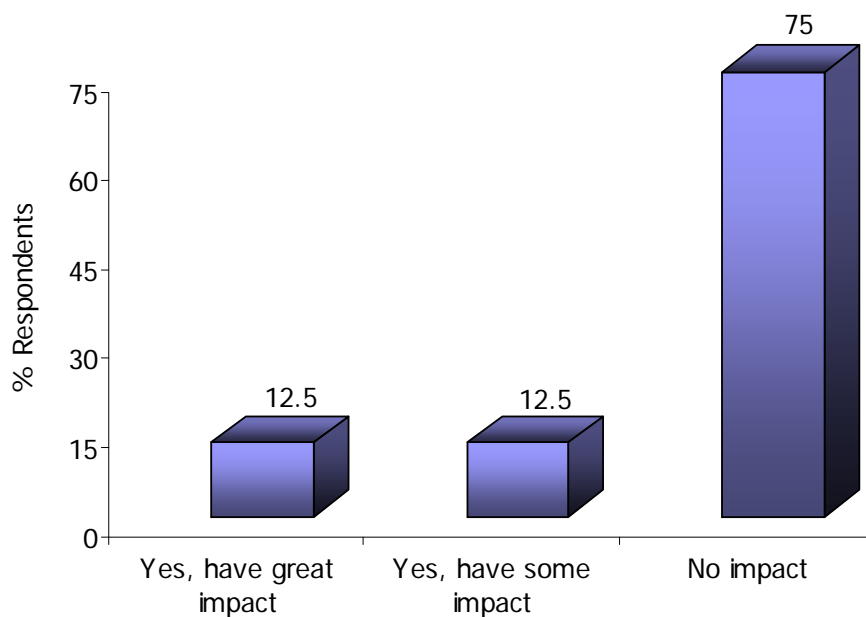
**ii) Impacts of sales ban on humphead wrasse on the trade**

75% of managers stated that banning humphead wrasse from being sold in Sabah would have no impact on their business. 12.5% managers stated that this move will have great impact to their business, while the remaining 12.5% admitted to some degree of impact.

**Table 51:** Impacts of sales ban on Humphead Wrasse on the trade

	No. of Respondents	Percentage (%)
Yes, have great impact	1	12.5
Yes, have some impact	1	12.5
No impact	6	75
Total	8	100

**Chart 48:** Impacts of sales ban on Humphead Wrasse on the trade



## 5.2.4 ATTITUDE TOWARDS UNETHICAL FISHING METHOD

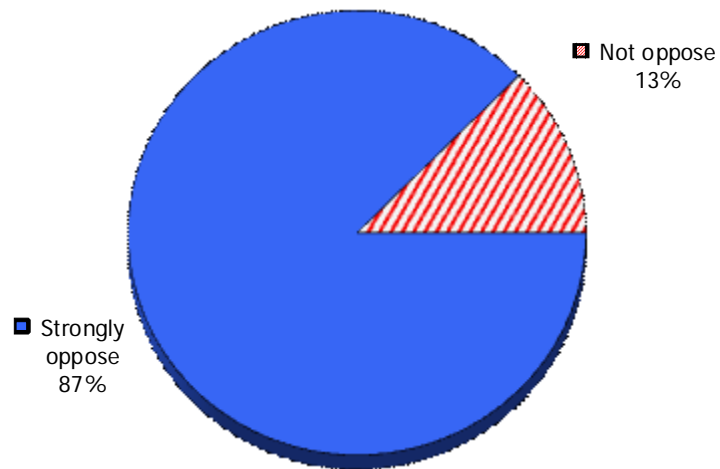
### i) Opinion on Cyanide fishing

Seven out of eight (87.5%) restaurant managers strongly opposed the use of cyanide in catching LRF, while one manager did not express his disagreement with this destructive fishing method.

**Table 52:** Opinion on Cyanide fishing

	No. of Respondents	Percentage (%)
Strongly oppose	7	87.5
Not oppose	1	12.5
<b>Total</b>	<b>8</b>	<b>100</b>

**Chart 49:** Opinion on Cyanide fishing



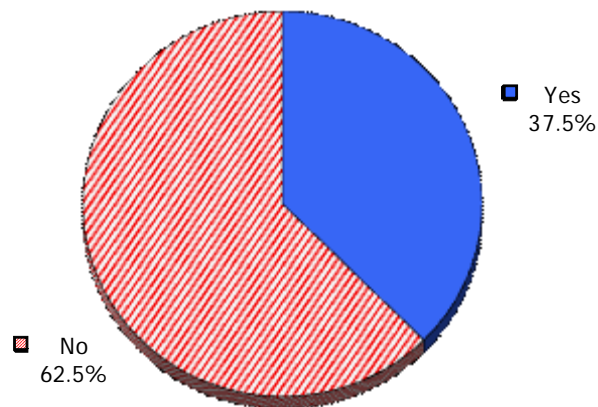
ii) **Consumers' concern with cyanide poisoning in LRF**

Only three out of eight managers (37.5%) reported that their consumers were worried about cyanide poisoning in the LRF that they eat. The majority of consumers as reported by five managers (62.5%) were generally unconcerned about the risk of food poisoning caused by cyanide residual. This can partly be attributed to the fact that 44% of the polled consumers were not aware of the use of cyanide in fishing as referred in **Table 32**.

**Table 53:** Consumer's concern on Cyanide poisoning in LRF

	<b>No. of Respondents</b>	<b>Percentage (%)</b>
Yes	3	37.5
No	5	62.5
<b>Total</b>	<b>8</b>	<b>100</b>

**Chart 50:** Consumer's concern on Cyanide poisoning in LRF



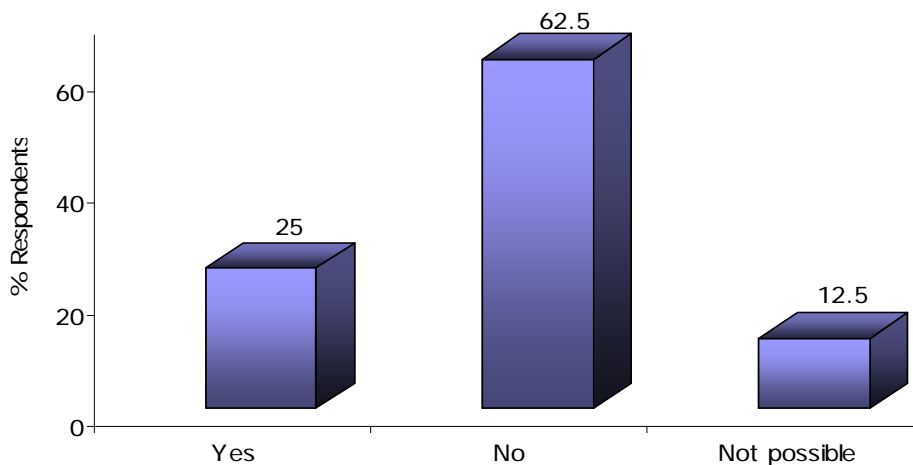
**iii) Guarantee that LRF supply was not caught with Cyanide**

Six out of eight (75%) managers admitted that they could not guarantee that their LRF are not caught with cyanide. Only a small percentage of 25% or two managers guaranteed that LRF supplied by their supplier were not caught with cyanide.

**Table 54:** Guarantee that LRF supply was not caught with Cyanide

	No of Respondents	Percentage (%)
Yes	2	25
No	5	62.5
Not possible	1	12.5
<b>Total</b>	<b>8</b>	<b>100</b>

**Chart 51:** Guarantee that LRF supply was not caught with Cyanide



iv) **Attitude towards purchasing LRF caught with cyanide**

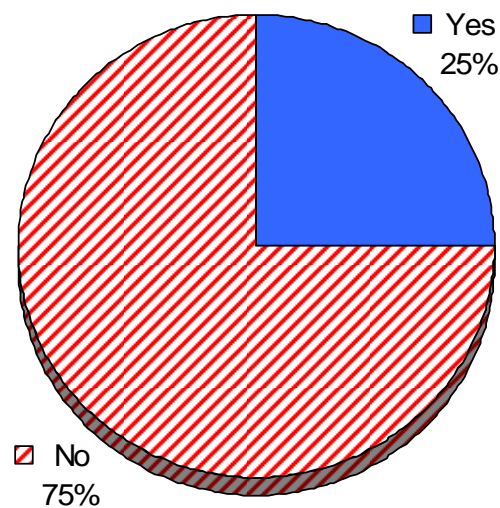
75% or six out of eight managers interviewed stated that if they had prior knowledge that the LRF supplied by their suppliers were caught with cyanide, they would not purchase them.

On the contrary, two managers (25%) stated that they would still buy fish caught with cyanide.

**Table 55:** Attitude towards purchasing LRF caught with cyanide

	No. of Respondents	Percentage (%)
Yes	2	25
No	6	75
<b>Total</b>	<b>8</b>	<b>100</b>

**Chart 52:** Attitude towards purchasing LRF caught with cyanide



## 5.2.5 ATTITUDE TOWARDS CERTIFIED LRF AND THE ESTABLISHMENT OF GREEN IMAGE

### i) Support for fish certification

All eight managers interviewed pledge to support the move to certify fish suppliers for conservation purposes.

**Table 56:** Support for fish certification

	No of Respondents	Percentage (%)
Yes, support	8	100

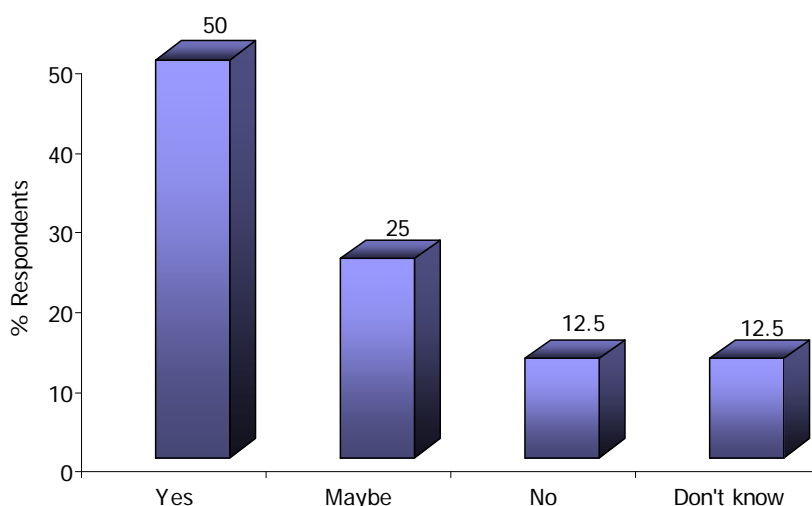
### ii) Consumers' acceptance of more expensive certified LRF

Half of the managers interviewed were confident that their consumers would support certified LRF despite the more expensive price. 25% of managers were not sure whether this arrangement would work. One manager stated that his consumer would reject the more expensive certified fish. The remaining one manager could not provide any indication.

**Table 57:** Consumers' acceptance of more expensive certified LRF

	No. of Respondents	Percentage (%)
Yes	4	50
Maybe	2	25
No	1	12.5
Don't know	1	12.5
<b>Total</b>	<b>8</b>	<b>100</b>

**Chart 53:** Consumers' acceptance of more expensive certified LRF



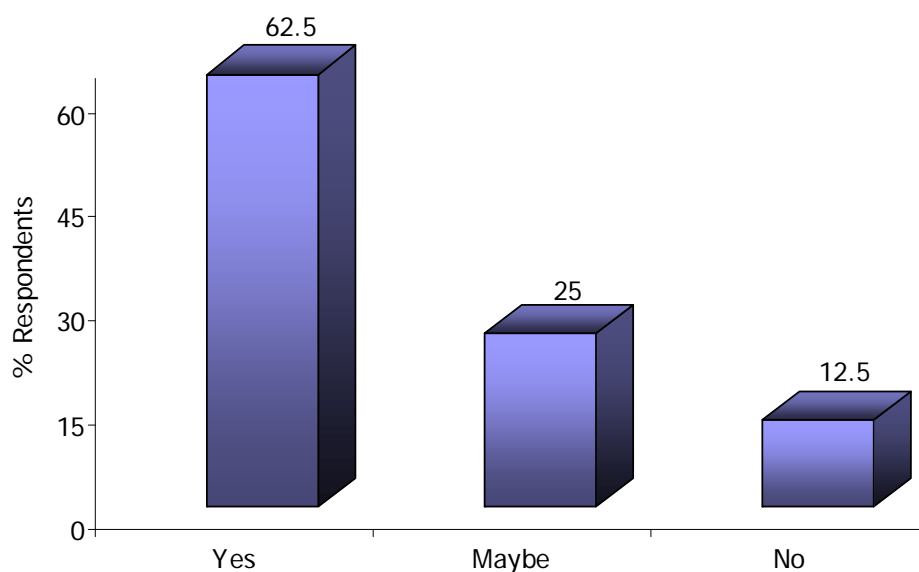
### iii) Support for green image

Five out of eight managers (62.5%) believed serving certified LRF and establishing a green image would help their business as consumers would see them as being environmentally friendly. Two managers (25%) were not convinced this would be the case, and one manager (12.5%) did not agree with this statement.

**Table 58:** Support for green image

	No of Respondents	Percentage (%)
Yes	5	62.5
Maybe	2	25
No	1	12.5
<b>Total</b>	<b>8</b>	<b>100</b>

**Chart 54:** Support for green image



## 5.2.6 IMPACTS OF CIGUATERA AND RED-TIDE POISONING ON THE TRADE

### i) Impacts of ciguatera fish poisoning on the trade

Ciguatera is a food-borne poisoning in humans caused by eating marine species contaminated with a toxin known as *ciguatoxin*, which originates from a toxic marine microorganism, dinoflagellate, living on dead coral reef and algae. The toxin passes up the food chain through herbivorous fish, carnivorous fish, and finally to man. The larger the fish, the higher the concentration of this toxin.

Ciguatoxin does not cause any harm to the marine fish. Cooking does not destroy the ciguatoxin.

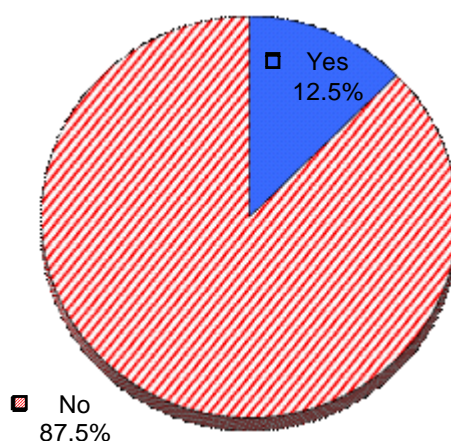
The symptoms of ciguatera are gastrointestinal (nausea, vomiting, diarrhoea) followed by neurological symptoms such as headaches, muscle aches, numbness and hallucinations. Severe cases of ciguatera can also result in hot-cold reversal, in which hot and cold sensations seem reversed<sup>2</sup>.

Survey results disclosed that only one out of the eight managers interviewed had his business affected by ciguatera poisoning.

**Table 59:** Impacts of Ciguatera fish poisoning on the trade

	No. of Respondents	Percentage (%)
Yes	1	12.5
No	7	87.5
<b>Total</b>	<b>8</b>	<b>100</b>

**Chart 55:** Impacts of Ciguatera fish poisoning on the trade



## ii) Impacts of red tide poisoning on the trade

Red tide is an occasional natural phenomenon in Sabah where microorganisms (dinoflagellates), which are naturally living in the sea, undergo a population explosion. The numbers become so large and dense that sometimes they impart a brownish-red colour to the sea. The microorganisms usually are not very numerous in the seas and thus do not represent a health threat. When they multiply and are eaten in large numbers by filter-feeding sea life—such as oysters, mussels, clams and other bivalves—they render the shellfish toxic. Some fish, which eat these organisms or other larger sea life (which originally eat dinoflagellates), can become toxic due to the accumulation of these organisms in their guts.

<sup>2</sup> Ciguatera poisoning information obtained from Wikipedia encyclopaedia

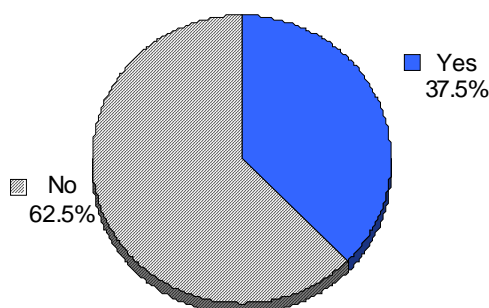


This becomes a public health problem when people eat shellfish with high levels of these microorganisms and suffer from Paralytic Shellfish Poisoning (PSP). In addition, these dinoflagellated organisms propagate so fast in the sea that they deplete the oxygen in the water and thereby kill fish by means of suffocation. This happened in Sabah in 2003 and 2004 when the dinoflagellate, *Cochlodinium polykrikoides*, populations exploded in numbers off the West Coast of Sabah. Such was the effect of the suffocating numbers that millions of Ringgits' worth of cultured marine fish in cages were killed and lost. Red tide was first recorded in 1976 in Sabah and has been a fairly annual occurrence, although serious outbreaks have occurred only a few times. The Department of Fisheries, Sabah, has put in effect a Red Tide Monitoring System to determine the occurrence of red tide<sup>3</sup>. The survey revealed that 37.5% or three out of eight seafood restaurants had their businesses affected by red tide poisoning, while 62.5% or five restaurants declared otherwise.

**Table 60:** Impacts of red tide poisoning on the trade

	No. of Respondents	Percentage (%)
Yes	3	37.5
No	5	62.5
<b>Total</b>	<b>8</b>	<b>100</b>

**Chart 56:** Impacts of red tide poisoning on the trade



### 5.2.7 ATTITUDE TOWARDS ALTERNATIVES IN THE FORM OF FARMED REEF FISH AND/OR FRESH WATER FISH

37.5% or three out of eight managers interviewed stated that they will recommend farmed LRF to their customer, citing health and conservation reasons as their selling points.

On the other hand, 37.5% restaurant managers stated that they will not recommend any alternatives to wild-caught LRF to their customers.

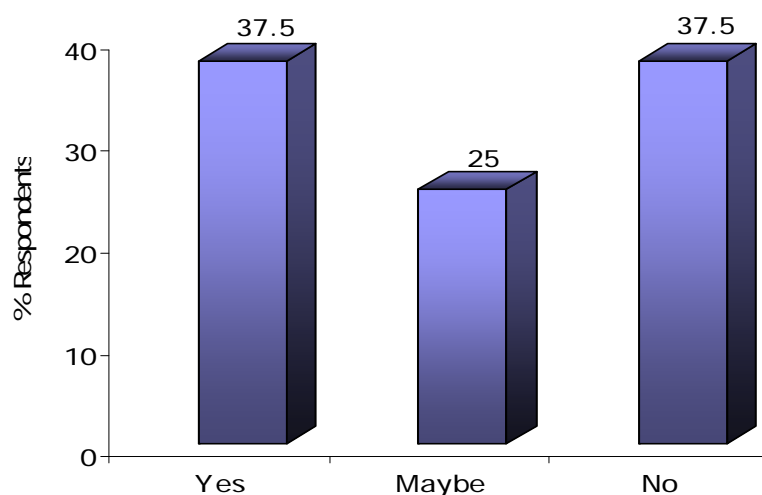
25% or two managers did not state their inclination.

<sup>3</sup> Information on Red Tides obtained from the Department of Fisheries Sabah, Malaysia.

**Table 61:** Potential of farmed reef fish / fresh water fish

	<b>No. of Respondents</b>	<b>Percentage (%)</b>
Yes	3	37.5
Maybe	2	25
No	3	37.5
<b>Total</b>	<b>8</b>	<b>100</b>

**Chart 57:** Potential of farmed reef fish / fresh water fish



#### **5.2.8 ATTITUDE TOWARDS EDUCATING LRF CONSUMER ON LRF CONSERVATION**

Seven out of eight managers supported WWF-Malaysia's campaign to promote marine conservation by encouraging environmentally friendly consumption of LRF.

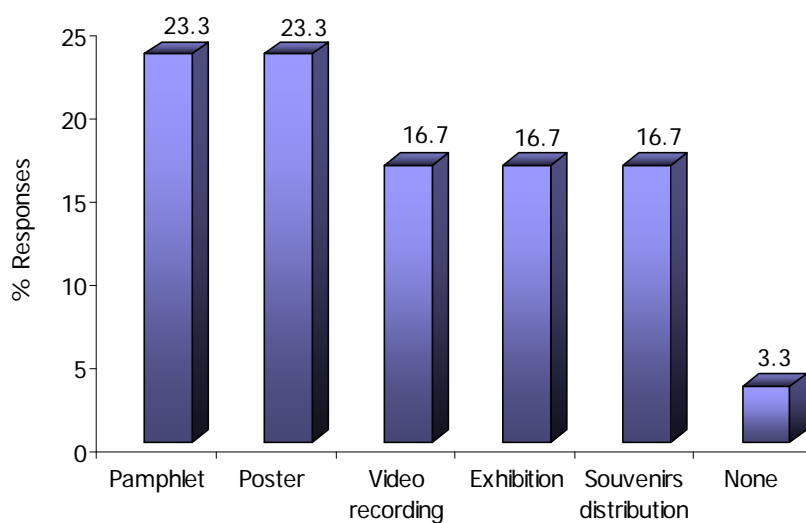
Pamphlets and posters were the top two preferred promotional items chosen by seven out of eight managers to be placed at their restaurants.

Video recording, exhibitions and souvenirs distribution were less preferred as promotional items. The special broadcasting license needed was inconvenient for restaurants to broadcast videos or documentaries. Exhibitions and souvenirs distribution need designated areas and human resource to manage, and were deemed to be more disruptive than pamphlets and posters.

**Table 62:** Attitude towards educating LRF consumer on LRF conservation

	Response	% of responses	% of respondents
Pamphlet	7	23.3	87.5
Poster	7	23.3	87.5
Video recording	5	16.7	62.5
Exhibition	5	16.7	62.5
Souvenirs distribution	5	16.7	62.5
None	1	3.3	12.5
<b>Total</b>	<b>30</b>	<b>100</b>	
Total respondents :8			

**Chart 58:** Attitude towards educating LRF consumer on LRF conservation



## PART THREE: RESTAURANT MANAGER ATTITUDE SURVEY IN TAWAU AND SANDAKAN

### 6. SURVEY RESULTS – RESTAURANT MANAGERS (TAWAU & SANDAKAN)

#### 6.1 IDENTIFICATION OF LRF SOLD IN SEAFOOD RESTAURANTS

##### 6.1.1 Species

Seven (7) seafood restaurants in Sabah’s East Coast towns of Tawau and Sandakan participated in the Restaurant Manager Attitude Survey.

All seven restaurants offered live reef fish (LRF) on their menu.

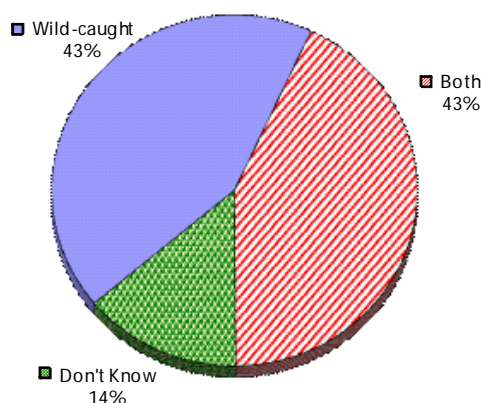
##### 6.1.2 Source

43% of the restaurant managers reported that LRF sold in their restaurants were wild-caught while another 43% reported that they sell both wild-caught and farmed reef fish. 14% or one manager did not know the source of the LRF sold by his restaurant.

**Table 63:** Seafood restaurants - source of LRF

	No. of Respondents	Percentage (%)
Wild-caught	3	43
Both	3	43
Don't Know	1	14
<b>Total</b>	<b>7</b>	<b>100</b>

**Chart 59:** Seafood restaurants - source of LRF



## 6.2 RESTAURANT MANAGERS' ATTITUDE TOWARDS LRF CONSERVATION

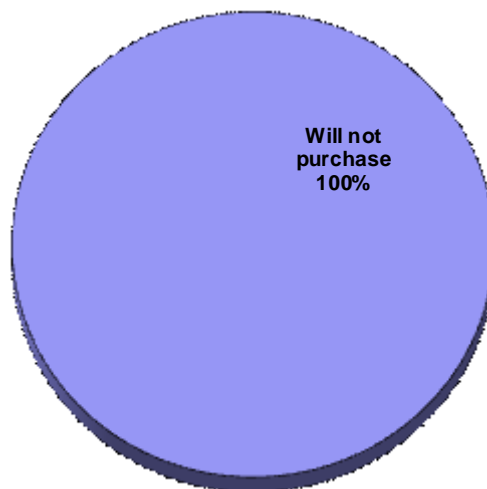
### 6.2.1 ATTITUDE TOWARDS PURCHASING SMALL-SIZED AND IMMATURE LRF

All seven restaurant managers stated their refusal to purchase very small-sized and immature LRF.

**Table 64:** Attitude towards purchasing small-sized and immature LRF

	No. of Respondents	Percentage (%)
Will not purchase	7	100
<b>Total</b>	<b>7</b>	<b>100</b>

**Chart 60:** Attitude towards purchasing small-sized and immature LRF



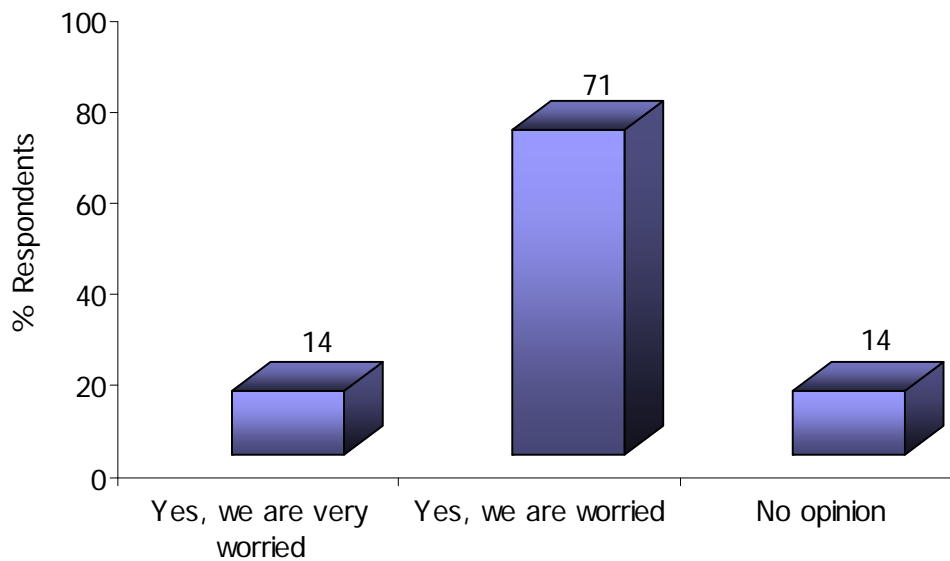
## 6.2.2 ATTITUDE TOWARDS THE DECREASING NUMBERS OF LRF

Five restaurant managers (71%) were worried over the sustainability of the trade, noting the possibility of decreasing LRF supply in the future due to unsustainable harvesting practices. One restaurant manager was very worried, while another offered no opinion.

**Table 65:** Concern over decreasing LRF supply

	No. of Respondents	Percentage (%)
Yes, we are very worried	1	14
Yes, we are worried	5	71
No opinion	1	14
<b>Total</b>	<b>7</b>	<b>100</b>

**Chart 61:** Concern over decreasing LRF supply



### 6.2.3 ATTITUDE TOWARDS MEASURES TO ADDRESS THE DECREASING NUMBERS OF LRF

#### i) Establishment of minimum size limits for LRF catches or import/ sales ban of LRF species

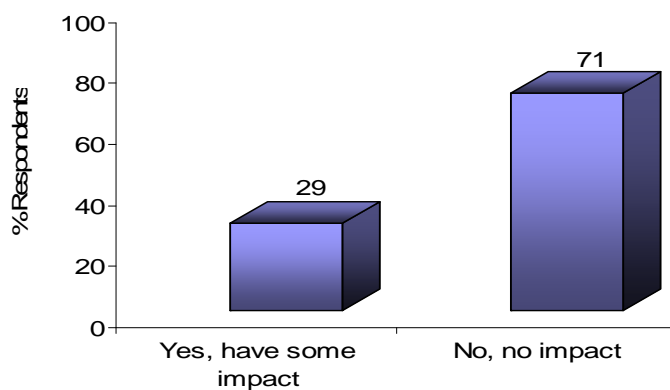
Five out of seven restaurant managers or 71% believed that there would be no impact on their business if the Sabah Government imposed size limits on LRF catches and on imports of LRF into the state. Only two managers (29%) were worried that these moves would have some impact on their business.

Nevertheless, all seven managers expressed their support towards conservation measures to promote sustainable fisheries, such as imposing size limits on LRF catches and on LRF imports into Sabah.

**Table 66:** Impact of size limits on LRF catches and imports on the trade

	No of Respondents	Percentage (%)
Yes, have some impact	2	29
No, no impact	5	71
<b>Total</b>	<b>7</b>	<b>100</b>

**Chart 62:** Impact of size limits on LRF catches and imports on the trade



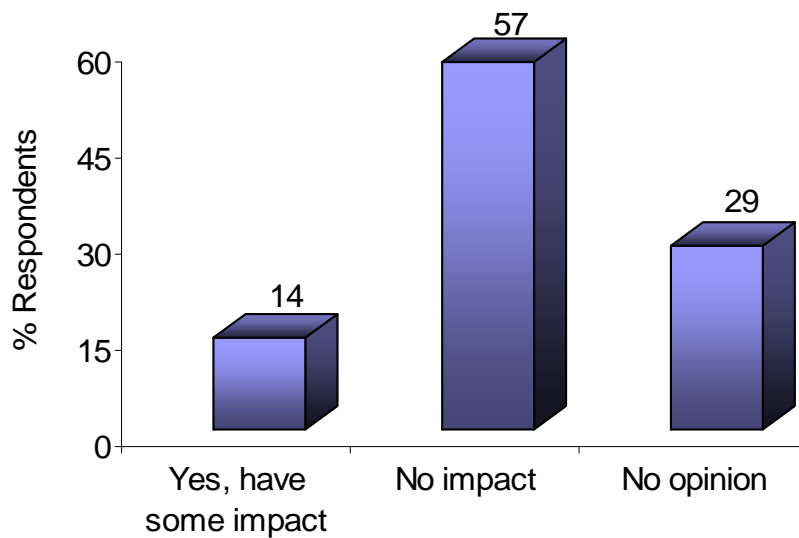
ii) **Impacts of sales ban on humphead wrasse on the trade**

Four managers (57%) stated that banning humphead wrasse from being sold in Sabah would have no impact on their business. 14% or one manager stated that this move would have some degree of impact to his business, while the remaining two managers (29%) did not offer any opinion on the impact this move would have on their business.

**Table 67:** Impacts of sales ban on Humphead Wrasse on the trade

	No. of Respondents	Percentage (%)
Yes, have some impact	1	14
No impact	4	57
No opinion	2	29
<b>Total</b>	<b>7</b>	<b>100</b>

**Chart 63:** Impacts of sales ban on Humphead Wrasse on the trade





#### 6.2.4 ATTITUDE TOWARDS UNETHICAL FISHING METHOD

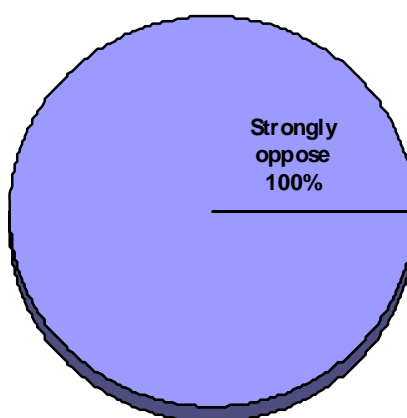
##### i) Opinion on Cyanide fishing

All seven restaurant managers strongly opposed the use of cyanide in catching LRF.

**Table 68:** Opinion on Cyanide fishing

	No. of Respondents	Percentage (%)
Strongly oppose	7	100
<b>Total</b>	<b>7</b>	<b>100</b>

**Chart 64:** Opinion on Cyanide fishing



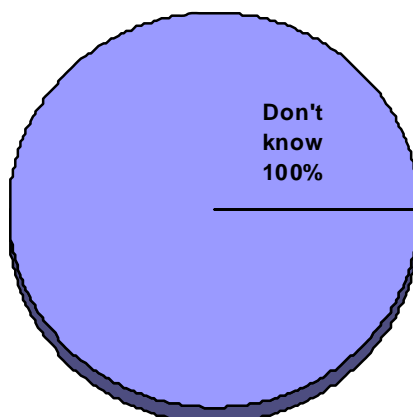
##### ii) Consumers' concern with cyanide poisoning in LRF

All seven restaurant managers reported that they did not know whether their customers were worried about cyanide poisoning in the LRF that they eat.

**Table 69:** Consumer's concern on Cyanide poisoning in LRF

	No. of Respondents	Percentage (%)
Don't Know	7	100
<b>Total</b>	<b>7</b>	<b>100</b>

**Chart 65:** Consumer's concern on cyanide poisoning in LRF



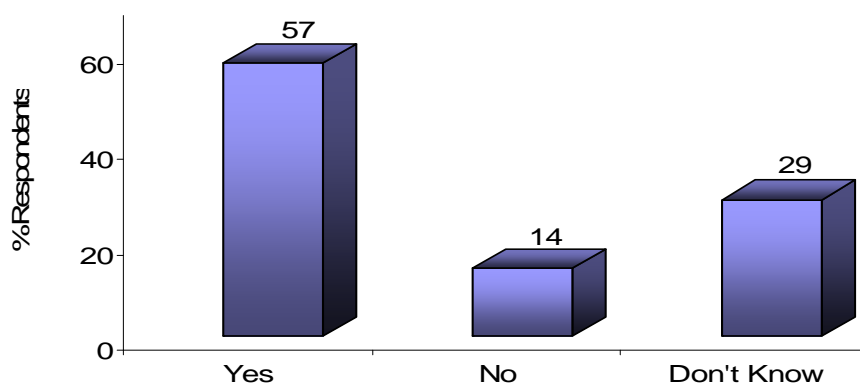
**iii) Guarantee that LRF supply was not caught with Cyanide**

Four out of seven (57%) managers guaranteed that their LRF supply was not caught with cyanide. One manager (14%) admitted that he cannot guarantee this and two managers (29%) did not know whether their LRF were caught with cyanide.

**Table 70:** Guarantee that LRF supply was not caught with Cyanide

	No of Respondents	Percentage (%)
Yes	4	57
No	1	14
Don't Know	2	29
<b>Total</b>	<b>7</b>	<b>100</b>

**Table 66:** Guarantee that LRF supply was not caught with Cyanide



**iv) Attitude towards purchasing LRF caught with cyanide**

All seven managers interviewed stated that if they have prior knowledge that the LRF supplied by their suppliers were caught with cyanide, they would not purchase them.

**Table 71:** Attitude towards purchasing LRF caught with Cyanide

	<b>No. of Respondents</b>	<b>Percentage (%)</b>
Would not purchase	7	100
<b>Total</b>	<b>7</b>	<b>100</b>

**Chart 67:** Attitude towards purchasing LRF caught with Cyanide



## 6.2.5 ATTITUDE TOWARDS CERTIFIED LRF AND THE ESTABLISHMENT OF GREEN IMAGE

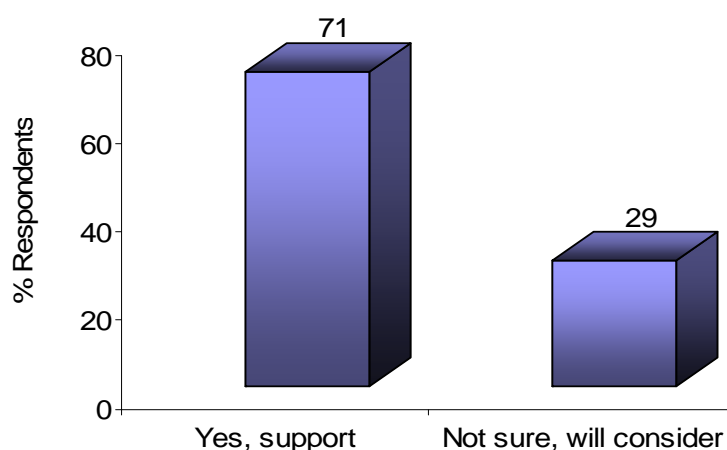
### i) Support for fish certification

Five out of seven managers (71%) interviewed pledged to support the move to certify fish suppliers for conservation purposes. The remaining two managers (29%) were not sure but agreed to consider supporting this move.

**Table 72:** Support for fish certification

	No of Respondents	Percentage (%)
Yes, support	5	71
Not sure, will consider	2	29
<b>Total</b>	<b>8</b>	<b>100</b>

**Chart 68:** Support for fish certification



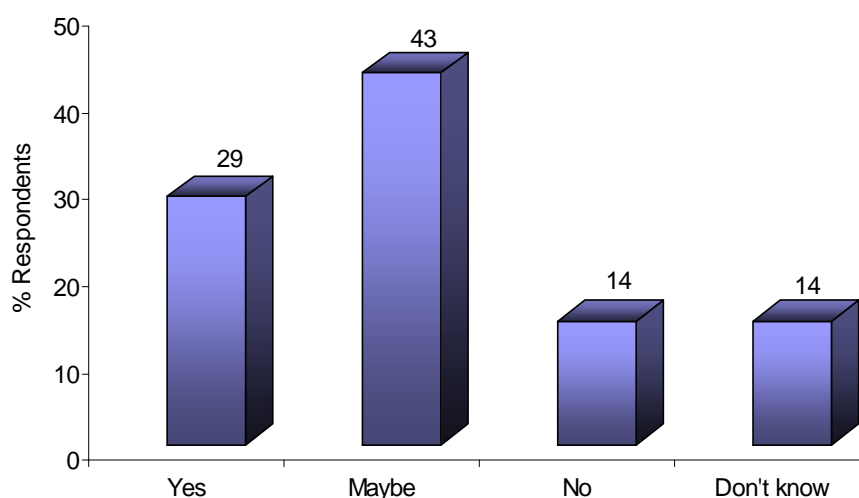
### ii) Consumers' acceptance of more expensive certified LRF

Two managers (29%) interviewed were confident that their consumers would support certified LRF despite the more expensive price. Three managers (43%) were not sure whether this arrangement would work. One manager (14%) stated that his consumer would reject the more expensive certified fish. The remaining one manager (14%) could not provide any indication.

**Table 73:** Consumers' acceptance of more expensive certified LRF

	<b>No. of Respondents</b>	<b>Percentage (%)</b>
Yes	2	29
Maybe	3	43
No	1	14
Don't know	1	14
<b>Total</b>	<b>7</b>	<b>100</b>

**Chart 69:** Consumers' acceptance of more expensive certified LRF



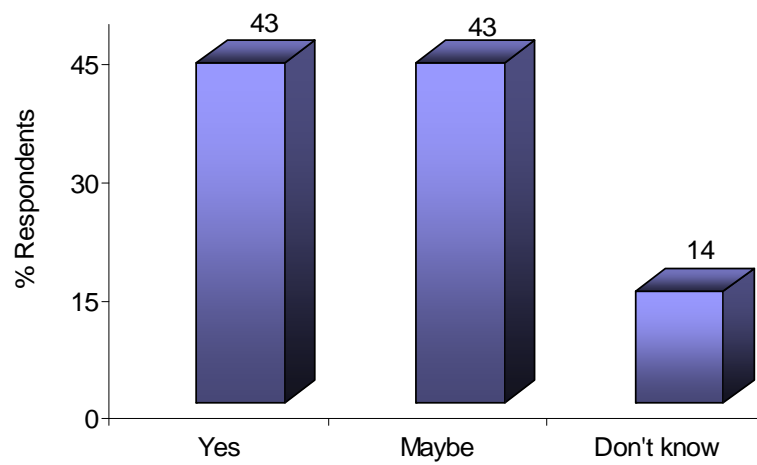
**iii) Support for green image**

Three out of seven managers (43%) believed that serving certified LRF and establishing a green image would help their business as consumers would see them as being environmentally friendly. Another three managers (43%) were doubtful that certified LRF and the associated green image would help their business, while one manager (14%) did not have any idea whether these would help his business.

**Table 74:** Support for green image

	<b>No of Respondents</b>	<b>Percentage (%)</b>
Yes	3	43
Maybe	3	43
Don't know	1	14
<b>Total</b>	<b>7</b>	<b>100</b>

**Chart 70:** Support for green image



## 6.2.6 IMPACTS OF CIGUATERA AND RED TIDE POISONING ON THE TRADE

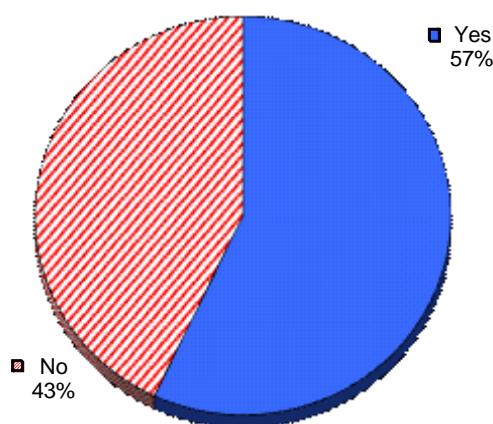
### i) Impacts of ciguatera fish poisoning on the trade

Ciguatera poisoning, a locally notifiable disease, is commonly reported as a seafood-toxin illness caused by toxins synthesized by photosynthetic dinoflagellate, *Gambierdiscus toxicus*, from coral reefs (Wong et al. 2008). Survey results disclosed that 57% of the managers interviewed had their businesses affected by ciguatera poisoning.

**Table 75:** Impacts of Ciguatera fish poisoning on the trade

	No. of Respondents	Percentage (%)
Yes	4	57
No	3	43
<b>Total</b>	<b>7</b>	<b>100</b>

**Chart 71:** Impacts of Ciguatera fish poisoning on the trade



### ii) Impacts of red tide poisoning on the trade

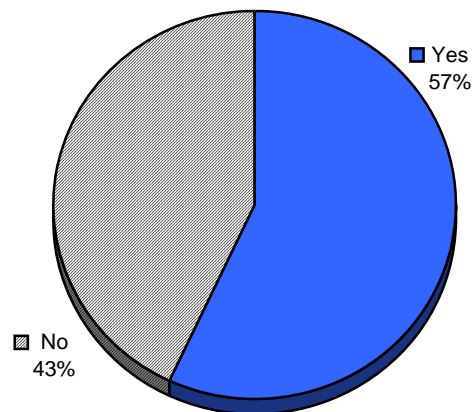
As illustrated earlier, red tide is an occasional natural phenomenon that often occurs in West Coast of Sabah. However, seasonal occurrences of this phenomenon did not affect restaurant managers in ensuring the continuous progress of their LRF seafood restaurants. The survey revealed that 57% or four out of seven seafood restaurants had their business affected by red tide poisoning, while 43% or three restaurants declared that red tide has not affected their business.

Result indicated that almost half of the managers may have access to unaffected LRF from East Coast of Sabah as alternative sources for LRF for their restaurants all year long.

**Table 76:** Impacts of red tide poisoning on the trade

	No. of Respondents	Percentage (%)
Yes	4	57
No	3	43
<b>Total</b>	<b>7</b>	<b>100</b>

**Chart 72:** Impacts of red tide poisoning on the trade





### 6.2.7 ATTITUDE TOWARDS ALTERNATIVES IN THE FORM OF FARMED REEF FISH AND/OR FRESH WATER FISH

The majority of managers (43%) interviewed were non-committal in their response when asked whether they would recommend farmed LRF as alternatives to wild-caught LRF for health and conservation reasons.

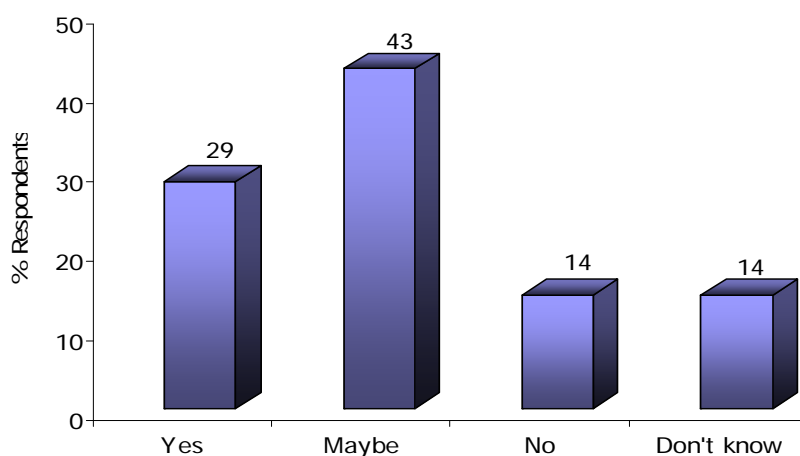
On the other hand, two (29%) restaurant managers stated that they would recommend farmed LRF to their customer in the interest of conserving the population of wild-LRF.

One manager (14%) stated that he would not recommend farmed LRF to his customers, while the remaining manager (14%) did not offer any information on his opinion.

**Table 77:** Potential of farmed reef fish / fresh water fish

	No. of Respondents	Percentage (%)
Yes	2	29
Maybe	3	43
No	1	14
Don't know	1	14
<b>Total</b>	<b>7</b>	<b>100</b>

**Chart 73:** Potential of farmed reef fish / fresh water fish



### 6.2.8 ATTITUDE TOWARDS EDUCATING LRF CONSUMERS ON LRF CONSERVATION

All seven managers supported WWF-Malaysia's campaign to promote marine conservation by encouraging environmentally friendly consumption of LRF.

Pamphlets and posters were the top two preferred promotional items chosen to be placed at consenting managers' restaurants.

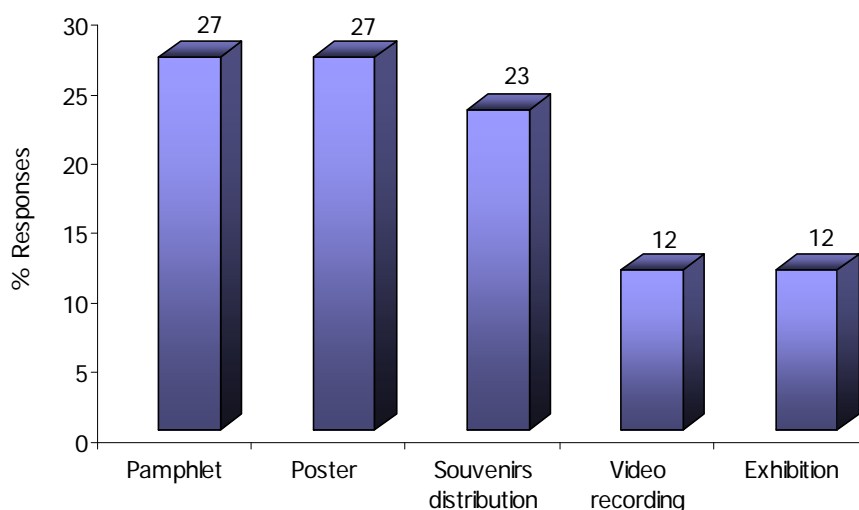
Souvenir distribution was another popular choice, favoured by six managers.

Video recording and exhibitions were less popular promotional items. Special broadcasting license was needed by restaurants to broadcast videos or documentaries. Exhibitions also need designated areas and human resource to manage, and were deemed to be more disruptive than pamphlets and posters.

**Table 78:** Attitude towards educating LRF consumer on LRF conservation

	Response	% of responses	% of respondents
Pamphlet	7	27	100
Poster	7	27	100
Souvenirs distribution	6	23	86
Video recording	3	12	43
Exhibition	3	12	43
<b>Total</b>	<b>26</b>	<b>100</b>	<b>371</b>
Total respondents : 7			

**Chart 74:** Attitude towards educating LRF consumer on LRF conservation



## PART FOUR: DISCUSSION

### 7.1 CONSUMER ATTITUDE SURVEY

The survey conducted in 2010 showed a huge growth of LRF restaurants in the capital city of Sabah. This is an indicator that the live reef fish trade in this state is a serious money making industry to meet the growing demand on seafood since 2006. This also indicates an influx of tourists who had chosen Sabah as the perfect destination for food and relaxation.

#### 7.1.1 CONSUMPTION PATTERNS AND EATING HABITS OF LRF CONSUMERS

The consumers interviewed in the surveys comprised mostly of local consumers (77%), while tourists from Hong Kong were the largest number of foreign respondents during the survey. This indicates that locals, irrespective of race and religion, were relatively frequent patrons at seafood restaurants in Sabah. The increasing influx of foreign tourists, especially from Hong Kong, Brunei, Korea and Japan among others, in recent years is due to the aggressive promotion to visit Malaysia as reported by Sabah Tourism Board (2010). Besides destination attributes, food, i.e., LRF, is another attractant that boosts tourism and adds value to the image (Hsu et al. 2009; Quan and Wang, 2004) of the state.

Besides the fact that fish was regarded as a *halal* product among LRF consumers, the survey found that there was an overwhelming proportion of respondents who liked eating LRF. This conforms to the opinion of Trondsen et al. (2004) that higher fish consumption is associated with increasing consumers' belief and behaviour according to food's importance to health, high fish consumption in childhood and a higher level of education and income. LRF is a highly-sought after food among professionals and those involved in the service industry due to its taste, freshness and texture. Interestingly, the age groups of LRF consumers were those at 21 to 50 years of age. According to Verbeke et al. (2007), consumers aged between 40 and 55 years old described themselves as the most confident in evaluating fish quality, while consumers younger than 25 years old rated themselves as the least able to evaluate fish quality. In comparison, this survey has interestingly indicated that consumers of LRF in Sabah comprised of both younger and older generations. Results also showed that more than 60% of the consumers knew their preferences, which was either to choose a specific fish or simply any LRF fish from the tanks. Therefore, consumers at the age group of 21 to 50 years old may be regarded as the elite consumers of LRF in Sabah.

The survey also found that most people preferred to eat LRF in restaurants rather than at home. This was probably due to the convenience of dining out instead of having to prepare a dead LRF to be eaten at home. Tuu et al. (2008) reported that consumers' fish-eating behaviour may be motivated not only through family expectations or social norms but also by the attitude and behaviour of people in their social environment. Results of this survey showed similar norms whereby consumers adopted the norm of eating LRF in Sabah as a social affair rather than as tradition or for special occasions. In other words, the LRF consumers in Sabah have a sense of ownership and pride on the LRF availability and thus, are socially obligated to introduce peers, colleagues, family members and foreign tourists to LRF consumption, and make Sabah a distinctive state in Malaysia known as the Seafood Basket of Malaysia.

In Kota Kinabalu itself, almost 70% of the respondents were LRF regular eaters of at least twice on a monthly basis. Customers having a high purchasing power at an average pay-scale of RM5000 per month may also be a factor contributing to this norm and dining pattern practised by those who patronize LRF restaurants.

### **7.1.2 THE PREFERENCE ATTRIBUTE OF LRF**

Brown and red groupers were the most common fish ordered by the respondents. These species were also the most common LRF fish sold in the restaurants. Consumers of these two groupers may have developed benefit perceptions in terms of taste and vast experience of consumption of the fish as indicated by Fischer and Frewer (2009). In addition to that, nearly 70% of the consumers were knowledgeable in LRF in Sabah restaurants. It was also observed that the consumers did not order humphead wrasse nor mouse grouper during the survey. Both species were also not found in the restaurants.

The survey indicated preferences for smaller and cheaper LRF fish by consumers. The most desired size for fish were less than 1kg or 1-1.5kg with prices less than RM150. Larger fishes, especially those of more than 1.5kg, were not in demand. High frequency of eating LRF at restaurants, pricing and preferences attributes, i.e., smaller fish has better texture, may relatively affect customer's choice in choosing moderate fish size for consumption.

The source of LRF is essentially important to some consumers. The survey found that almost all the respondents did not know whether the fish were either wild-caught or farmed. In Sabah, LRF fingerlings, especially groupers, are caught from the wild and grown-out in floating cages until they attain edible size for the seafood restaurants. Although alteration of production-related traits occurs in domestication process (Glober et al. 2009), the consumers were still unable to identify these differences between wild and domesticated LRF fish. Inability to distinguish source of fish may also be due to the quality attributes of LRFs being caught alive and served fresh to consumers. On the other hand, consumers of frozen LRF may be able to distinguish the source of fish because quality changes occur within 48 hours after slaughter in farmed fish (Komilus et al. 2008).

### **7.1.3 ATTITUDE TOWARDS CONSERVATION**

In this survey, respondents were generally supportive of conservation of live reef fish. The survey found that not more than 30% of the respondents consumed threatened species when they patronized LRF restaurants. They cited that taste and texture were the two main attributes for liking these two particular grouper species, while those who were not in favour cited that they disliked the taste and highlighted the high price (i.e., RM280/kg for humphead wrasse).

In addition, these elite consumers of LRF in Sabah (21 to 50 years old) were still unaware of the types of threatened LRF, in particular the humphead wrasse and giant grouper, despite the fact that they frequently patronized these outlets. This indicates that the lack of awareness on certain LRF among consumers is considerably high although more than 70% responded favourably to either reduce or stop consuming both live and dead threatened fish species in the survey.

It is encouraging that many consumers of LRF would reduce or stop eating certain species of live reef fish if they knew that they were endangered. Outreach efforts to create awareness among consumers may be possible in Sabah because the consumers are mostly educated and intellectual. This is a distinctive advantage in influencing them intellectually as suggested by Caro et al. (2003) and Caro et al. (1994). Being more knowledgeable in LRF status will strongly influence a consumer's

beliefs on the importance of LRF conservation, and will create a positive spill-over effect as suggested by Beedell and Rahman (1999) in choosing to either reduce or stop consuming threatened LRF.

#### 7.1.4 AWARENESS OF DESTRUCTIVE FISHING METHOD

Poison fishing is a widespread destructive fishing method used to capture live reef fish for the aquarium and food trades. Fishers use this method to dive down to the reef and squirt cyanide or other poisons in reef crevices to stun fish, rendering them easy to catch. Sodium cyanide and bleach are the two most commonly used poisons (Mak et al. 2005 and Wilson et al. 2008) at coral reefs. The impact of these poisons on the reef ranges from coral bleaching to death.

Exploitative fishing and its impact on coral reef ecosystems (Bryant et al. 1998) are as follows:

**Destroys habitat.** Destructive fishing destroys the habitat where reef fish species live and breed. The fish often flee into reef crevices, obliging the fishers to pry and hammer the reefs apart to collect their stunned prey.

**Reduces fish stocks.** A loss in the number of fish due to overfishing and/or habitat destruction can lead to fewer fish and reduces the ability of the fish to reproduce. A significant number of non-targeted species are also killed through destructive fishing.

**Disrupts the food web and ecosystem balance.** By reducing or removing a specific species, overfishing changes the coral reef food web. For example, removing an alga eating species, like parrot fish, could create conditions where algae may replace corals.

In Sabah, cyanide fishing is still a common yet illegal fishing method reportedly used by some of the fishermen to catch LRF, although related reports are lacking on this subject. Unlike the Philippines, where Mak et al. (2005) reported that agencies like the International Marine life Alliance-Philippines (IMA), and the Philippine Bureau of Fisheries and Aquatic Resources (BFAR) have developed a laboratory-based cyanide detection test (CDT) in 1991 to determine the presence of cyanide in live-caught fish, Sabah is still facing problems in combating illegal fishing methods like cyanide fishing. Nonetheless, the effort to further develop a reliable detector for cyanide is still ongoing and more efforts need to be undertaken to eradicate this unsustainable fishing method.

It is crucial for LRF consumers to know that cyanide fishing also poses human health risks to people, in particular LRF fishermen, through exposure to the poison. The survey findings indicated 60% of respondents had heard about cyanide fishing of LRF but not in detail on the possible biochemical and toxicological effects of occupational and dietary exposure of humans to cyanide poisoning. Little is known about the detrimental effects of consuming fish caught with cyanide. However, Okafor et al. (2002) reported that frequent and infrequent consumers of cassava food contaminated by cyanide (CN) and thiocyanate (SCN) in Nigeria suffered from (i) iodine deficiency disorder, (ii) pancreatic diabetes and (iii) high blood glucose level. In addition to that, Okafor and Maduagwu (1999) also reported that cyanide poisoning also aggravates hepatocellular vacuolation and centrilobular necrosis in chicken. At this point of time, there is no published report on effects of consuming LRF caught with cyanide and this indicates urgency for further research in future.

### **7.1.5 CONSUMER'S ATTITUDE TOWARDS ALTERNATIVES**

Nearly 70% of the consumers in this survey would seek for alternatives if they knew that the wild-caught LRF were categorised under threatened species. Alternatives consisted of either farmed reef fish or freshwater fish as long as they were cheaper and tasted better. In this scenario, it is important to understand the willingness of these consumers to shift their consumption pattern to alternatives in relation to conservation of threatened LRF. As elite consumers of LRF, they have portrayed a paradigm shift from normal to responsible consumers. This mode of change may be attributed to public awareness on LRF conservation and anti-illegal fishing through seminars, forums and meetings organised by government agencies (Department of Fisheries) and non-government agencies (WWF) in recent years. LRF consumers were mostly professionals with a high purchasing power and were influential in society. Success of future awareness programmes depends highly on this group's capability in influencing their peers to seek for a change in attitude towards LRF consumption.

Sensorial preferences also contribute to level of acceptance of farmed fish. Recent blind taste analysis conducted in Hong Kong revealed that most consumers could distinguish between farmed and wild-caught reef fish, with high preferences on wild-caught ones. This result adheres to a few comparative studies between wild and farmed fishes conducted on seabass (Alasalvar et al. 2002; Orban et al. 2002), gilthead sea bream (Grigorakis et al. 2002; Grigorakis et al. 2003), salmon (Farmer et al. 2000; Einen and Thomassen, 1998) and Atlantic halibut (Olsson et al. 2003). Results indicated significant differences between wild and cultured fish in terms of several attributes like lipid content and texture but farmed fishes are still acceptable to consumers. However, these results contradict to Komilus et al. (2008) on acceptance of sashimi obtained from farmed red sea bream and farmed LRF (Chan, 2007). Thus, methods of cooking or preparation may influence acceptability of farmed marine fish including LRF. In restaurants, LRF fishes are usually caught alive, steamed and served hot to consumers, which explains the tendency of farmed fish to develop softer muscles due to water loss in texture during cooking (Komilus et al. 2008). Preferences on farmed LRF can be promoted among consumers if more research can be focused in improving the quality of farmed fish in the near future.

### **7.2 RESTAURANT MANAGERS SURVEY**

The survey findings on restaurant managers' attitude at Kota Kinabalu and on the East Coast of Sabah demonstrated a high degree of concern on overfishing, cyanide fishing and selling of juvenile fish. Responses from managers on both the West and East coasts differed in some aspects like level of concern on declining trend of LRF population, guarantee on non-cyanide caught LRF, size of fish and green image trademark to LRF trade. Managers from Kota Kinabalu showed higher concern (75%) than East Coast managers on decreasing numbers of live reef fish. Kota Kinabalu, being the capital of Sabah, is the main entry point for most tourists into the state. Various facilities like daily flights, hotels, shopping malls including eatery outlets attract tourists to make Kota Kinabalu their choice destination in Sabah. Continuous supply of LRF to restaurants in Kota Kinabalu is important for managers to ensure that they can sustain their businesses, especially for foreigners. The findings from this survey indicated that consumers have developed a culture to eat at seafood restaurants all year round; thereby providing guaranteed demands for LRF. Tourist operators always include eating at LRF restaurants as part of the tour package, ensuring that restaurant managers in Kota Kinabalu are pressured to maintain continuous and enough supply of LRF at all time. Comparatively, there is not as much pressure on managers on the East Coast to supply LRF due to a lesser number of patrons demanding LRF.

LRF restaurant managers claimed that the quality of their fish is guarantee that their fish are not caught with cyanide. However, more than 60% of the managers in Kota Kinabalu were found to be less knowledgeable of the quality of LRF sold in their respective restaurants as compared to only 14% in East Coast. Managers from Kota Kinabalu usually obtain LRF from suppliers in Kudat or the East Coast of Sabah. Thus, it is impossible to know whether consignments are free from cyanide . In comparison, managers from the East Coast are in a better position to know the source of their fish sold in restaurants.

In general, all managers would not purchase very small sized or immature fish. Perceptions of small size or immature fish varied among managers. Most managers implied that small size fish are those with body weight less than 400gm. It is also important to note that more than 70% of these managers felt that an imposition of size limits on fish would not affect their businesses. The managers may feel that they are not jeopardizing the undersized fish because they prefer to buy fish that are bigger in size.

Most managers of LRF restaurants responded positively to projecting green image trademark in restaurants (62.5% in Kota Kinabalu and 43% in East Coast respectively). They felt that their businesses would do better by selling certified sustainable live reef fish. The survey findings also showed that most of the restaurant managers were supportive in helping to educate consumers by promoting environmentally friendly live reef fish consumption through pamphlets or posters. As LRF industry players, these managers conform to the opinion of Pomeroy et al. (2008) that industry players should be actively involved in regulating the LRF trade as that would be more cost-effective and lead to long term improvement in coral reefs and fishery resources.

## **PART FIVE: CONCLUSION**

### **8.1 CONSUMER ATTITUDE**

Fish is regarded as a *halal* product accepted widely by an overwhelming proportion of respondents who like eating LRF. The survey showed that both local residents and foreign tourists are consumers of LRF restaurants in Sabah. LRF is also considered as a highly sought-after food by consumers aged 21 to 50 years old due to its taste, freshness and texture. These elite consumers of LRF, especially locals, prefer to eat LRF at restaurants rather than at home all year round. Other attributes to eating out among the patrons are peer pressure in the social environment. Intrinsic values like sense of ownership and pride of showing off Sabah as the Seafood Basket of Malaysia trigger the social obligation to introduce peers, colleagues, family members and foreign tourists to LRF consumption. Size and source of LRF are important elements to consumers of LRF. In general, consumers preferred fish size between 1kg or 1-1.5kg with prices less than RM150 and sourced from responsible fishing methods. Results from the survey showed that brown and red groupers were species of high preference among consumers.

Consumers have a general agreement that some reef fish are threatened and will support conservation efforts put forward by NGOs or the Government. However, it is understood that more awareness need to be inculcated among LRF consumers as ways to reach the wider spectrum of society on importance of sustaining LRF. Awareness programmes through public meetings, exhibitions, hands-on exposure through study visits or attachment on research vessels by focusing on the elite consumers may escalate a holistic understanding of LRF conservation.

In addition to that, impacts of cyanide fishing to human health risks need to be made known to consumers. Consumers' willingness to shift to other alternatives like farmed reef fish or freshwater fish as symbol of support to ban illegal fishing is a sign of being responsible consumers and a positive sign of community-based regulation towards a sustainable LRF consumption.

### **8.2 MANAGER ATTITUDE**

Restaurant managers demonstrated a high degree of concern on overfishing, cyanide fishing and selling of juvenile fish. However, managers on the East and West coasts had different responses in terms of level of concern on the declining trend of LRF population, guarantee on non-cyanide caught LRF, size of fish and green image trademark to LRF trade. Kota Kinabalu as the capital of Sabah, has more population and this pressured managers to ensure continuous availability of LRF.

Managers at restaurants in East Coast of Sabah are more knowledgeable in terms of quality of LRF compared to counterparts from Kota Kinabalu because LRF are mostly caught from the East Coast and transported to Kota Kinabalu restaurants by suppliers. Size does matter to all managers because they will not purchase undersized and immature fish.

Generally, green image trademark projection in restaurants was also well-accepted by managers. Public awareness through pamphlets or posters was also suggested and they agreed to promote environmentally friendly live reef fish consumption to consumers.

In conclusion, both consumers and managers have a general consensus that some reef fish are threatened, and they expressed their efforts towards combating illegal fishing method like cyanide fishing. Customers were also willing to shift to other alternatives while managers agreed to a LRF



green image trademark projection in their restaurants as a symbol of supporting sustainable LRF.

## **PART SIX: RECOMMENDATIONS**

1. To establish linkages among restaurant managers/owners, government agencies, i.e., Department of Fisheries Sabah and Non-governmental organisations (NGOs), as their feedback as important stakeholders is crucial in regulating a sustainable LRF industry;
2. To establish and implement Information, Education and Communication programmes lead by Sabah based Institute of Higher Learning, government agencies and NGOs to increase awareness on the threats and issues of LRFF and LRFT among fishers and the public;
3. To pave a way for a resource management programme for public and private sector's active participation to execute each others role to ensure long-term benefits are sustained for LRFF and LRFT;
4. To promote long term data management/recording specifically for private entities who exploit the resources and the governing bodies which regulate it;
5. To conduct collaborative research related to economics of LRF restaurants, eating patterns of foreign tourists, impacts of cyanide fishing, i.e., cyanide poisoning, to human health and others;
6. To conduct more research on LRF related issues, i.e., develop reliable detector for cyanide detection; improve quality of farmed fish;
7. To promote alternatives to wild-caught live reef fish like farmed fish and freshwater fish by recommending that consumers purchase these fishes on a regular and frequent basis for regular meals and wild-caught fish could be saved for truly special occasions;
8. To institutionalize and implement recommendations suggested by Department of Fisheries Sabah (Busing 2004) which includes (i) Resource assessment and fishery viability; (ii) Fishery management and planning; (iii) Fishing operations; (iv) Mariculture development; (v) Management of exports; (vi) Public awareness and stakeholder participation to combat cyanide fishing; (vii) Institutional capacity building; (viii) Funding and (ix) Regional cooperation.

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## APPENDIX 1: SURVEY QUESTIONNAIRE – CONSUMER

### Questionnaire of Customers

- |                             |
|-----------------------------|
| 1) Restaurant Name: _____   |
| 2) Enumerator: _____        |
| 3) Date of Interview: _____ |
| 4) Time of interview: _____ |

(Only interview customers seated at Even-numbered table)

1. Do you like to eat reef fish?

- |   |   |
|---|---|
| <input type="checkbox"/> Yes  | <input type="checkbox"/> Neutral ( <b>skip to Q5</b> )            |
| <input type="checkbox"/> No ( <b>answer Q2 and skip to Q4</b> )         | <input type="checkbox"/> Depends on species ( <b>skip to Q5</b> ) |
| <input type="checkbox"/> Don't know / Hard to say ( <b>skip to Q5</b> ) | <input type="checkbox"/> Refuse to answer ( <b>skip to Q5</b> )   |

2. Here is a guide of fish species that we usually call Reef Fish. Which kind of fish have you ordered tonight? (**Show Fish Guide**)

3.

#### **MARINE**

- 1) Brown Groupers  
(Greasy Grouper, Tiger Grouper)
- 2) Red Groupers (Red Coral Trout/Sunuk)
- 3) Snappers (Red snapper, mangrove snapper, mangrove red snapper, white or emperor snapper/hoi tai kai)
- 4) High Finned/Mouse Grouper
- 5) Humphead/Napoleon Wrasse (Mameng)
- 6) Giant Grouper

#### **FRESHWATER**

- 7) Seabass/Siakap
- 8) Tilapia
- 9) Marble Goby Fish
- 10) Others \_\_\_\_\_
- 11) Eat reef fish but did not order tonight  
**(go to Q3)**
- 12) Have not eaten these fish (**go to Q19**)
- 13) Refuse to answer

4. Why do you like to eat reef fish? (**Multiple answers. If YES to this question skip to Q5**)

- |   |   |                                       |
|---|---|---------------------------------------|
| <input type="checkbox"/> 1) Taste good                                | <input type="checkbox"/> 2) Good texture                  | <input type="checkbox"/> 3) Freshness |
| <input type="checkbox"/> 4) Nutritious                                | <input type="checkbox"/> 5) Expensive / rarity            | <input type="checkbox"/> 6) Popular   |
| <input type="checkbox"/> 7) Chinese tradition                         | <input type="checkbox"/> 8) Like eating all kinds of fish |                                       |
| <input type="checkbox"/> 9) No specific reason/don't know/hard to say |   |                                       |
| <input type="checkbox"/> 10) Others, please specify: _____            |   |                                       |
| <input type="checkbox"/> 11) Refuse to answer                         |   |                                       |

5. Why don't you like to eat reef fish? (**go to Q19**)

- |  |  |
|--|--|
| <input type="checkbox"/> 1) Don't like the taste | <input type="checkbox"/> 2) No difference to the taste of other fish |
| <input type="checkbox"/> 3) Texture not good     | <input type="checkbox"/> 4) Too many bones                           |

- 5) Too expensive
- 6) Health concerns/food poisoning
- 7) Afraid they would become extinct
- 8) No specific reason/don't know/hard to say
- 9) Dislike eating all kinds of fish (**skip to demographic data Q26**)
- 10) Others, please specify\_\_\_\_\_
- 11) Refuse to answer

6. What is the average weight of reef fish you usually order?

- 1) less than 1 kg
- 2) 1-1.5 kg
- 3) 1.6-2 kg
- 4) 2.1-2.5 kg
- 5) 2.6-3 kg
- 6) 3.1-3.5 kg
- 7) 3.6-4 kg
- 8) 4.1-4.5 kg
- 9) 4.6-5 kg
- 10) 5.1-5.5 kg
- 11) 5.6-6 kg
- 12) 6 kg or above
- 13) Don't know
- 14) Refuse to answer

7. What is the average price per KG of live reef fish you usually order?

- 1) less than RM50
- 2) RM51-100
- 3) RM101-150
- 4) RM151-200
- 5) RM201-300
- 6) above RM300
- 7) Don't know
- 8) Refuse to answer

8. Do you know if the live reef fish you order is wild-caught or farmed?

- 1) Wild-caught
- 2) Farmed
- 3) Don't know
- 4) Refuse to answer

9. Where do you usually eat reef fish?

- 1) At home
- 2) Seafood restaurants
- 3) At hotel
- 4) Other places:\_\_\_\_\_
- 5) Not remember / hard to say
- 6) Refuse to answer

10. On what occasions would you order reef fish?

**(Enumerator reads out the four options & checks only ONE.)**

- 1) Banquets, such as wedding or birthday banquets
- 2) Chinese Festivals such as Lunar New Year / Spring festival
- 3) Dinner with family / relatives or friends
- 4) Business dinner
- 5) Others \_\_\_\_\_
- 6) Refuse to answer

11. Why do you eat reef fish on that occasion? \_\_\_\_\_

(Let consumer answer first. If they cannot think of the reason, read out options)

- 1) Appropriate in that occasion: looked nice to have a big fish
- 2) Appropriate in that occasion: need a big fish for the number of people present
- 3) Symbol of fortune
- 4) Tastes good / good texture
- 5) Freshness
- 6) Nutritious
- 7) Rarity / expensive
- 8) Curiosity

- 9) Popular                       10) It's a tradition                       11) Reasonably priced  
 12) No specific reason     13) Hard to say                       14) Refuse to answer  
 15) Other reason: \_\_\_\_\_

12. How often do you eat reef fish?

- 1) More than once a week                       2) Once a week                       3) Every half month  
 4) Every month                       5) Every two months     6) Every three months  
 7) Every four months                       8) Every five months     9) Every six months  
 10) Every six to twelve months                       11) Every twelve months or more  
 12) Not remember / Hard to say     13) Refuse to answer

13. Which is the most important factor that you consider in choosing a reef fish?

**(Enumerator reads out the four options & checks only ONE.)**

- 1) Price                       2) Freshness                       3) Size                       4) Species  
 5) Hard to say     6) Refuse to answer

14. When dining in a restaurant, how do you choose your fish?

**(Enumerator reads out the four options & checks only ONE.)**

- 1) Pick a species from the tanks                       2) Pick a specific fish from the tank  
 3) Choose a species from the table                       4) Ask for waiter's recommendation  
 5) No specific method                       6) Don't know/ Hard to say  
 7) Refuse to answer                       8) Others \_\_\_\_\_

15. If some fish species are threatened or decreasing in population, will you stop or reduce eating them?

- Yes, I will stop eating them                       Yes, I will reduce eating them                       No  
 Don't know / Hard to say                       Refuse to answer

16. Do you think that it can help conservation if you refuse to buy a threatened fish species even after it has been caught?

- Yes                       No                       Don't know / Hard to say  
 Refuse to answer

17. Do you like to eat humphead wrasse or giant grouper?

- 1) Like                       2) Neutral / noncommittal (**skip to Q19**)  
 3) Dislike (**skip to Q18**)     4) Haven't eaten before (**skip to Q19**)  
 5) Refuse to answer

18. Why do you like to eat them? (If YES skip to Q19. Multiple answers.)

- 1) Large size fish are a symbol of status
- 2) Tastes good
- 3) Good texture
- 4) Freshness
- 5) Nutritious
- 6) Rarity / expensive
- 7) Popular
- 8) Reasonably priced
- 9) Like eating all kinds of fish
- 10) Other reasons: \_\_\_\_\_
- 11) No special reason
- 12) Don't know / Hard to say
- 13) Refuse to answer

19. Why don't you like to eat them? (check ONE answer)

- 1) Don't like their taste
- 2) No difference to the taste of other fish
- 3) Texture not good / Too many bones
- 4) Health concerns / risk of ciguatoxin poisoning
- 5) Afraid they would become extinct
- 6) Too expensive
- 7) No special reason
- 8) Don't know / hard to say
- 9) Refuse to answer
- 10) Other reason: \_\_\_\_\_

20. Do you know that humphead wrasse and giant grouper are species vulnerable to extinction?  
(Vulnerable species means it is vulnerable to go extinct due to overfishing.)

- Yes
- No
- Refuse to answer

21. Have you ever heard about using cyanide in catching reef fish?

(If No, skip to Q22)

- Yes
- No
- refuse to answer

22. Do you know what threats cyanide fishing poses to the environment? (Multiple answers)

- 1) It kills too many fish
  - 2) It kills the coral reef
  - 3) Cyanide left in fish is harmful to consumers
  - 4) Don't know
  - 5) Refuse to answer
  - 6) Others
- \_\_\_\_\_

23. If farmed or freshwater fish are available, would you order them instead of wild-caught reef fish?  
(Enumerator reads out Options 1-4 & checks only ONE.)

- 1) Farmed reef fish (answer Q23 then skip to Q25)



- 2) Freshwater fish (e.g. Tilapia, etc.) (**answer Q23** then skip to Q25)
- 3) Will choose both (**answer Q23** then skip to Q25)
- 4) None of them will be chosen (skip to Q24)
- 5) Don't know/ Hard to say (skip to Q24)
- 6) Refuse to answer (skip to Q25)

24. Why will you choose farmed or freshwater fish?

**(If this question is answered, skip to Q25)**

- 1) No preference / Like eating all kinds of fish
- 2) Like eating any marine fish/ live fish
- 3) Like eating any fresh fish
- 4) Afraid reef fish will be extinct
- 5) Cheaper in price
- 6) Better taste
- 7) Better texture
- 8) Lower risk of ciguatoxin poisoning
- 9) Hard to say / No specific reason
- 10) Refuse to answer
- 10) Other reason: \_\_\_\_\_

25. Why won't you choose farmed or freshwater fish?

- 1) Taste not good
- 2) Texture not good
- 3) Too common
- 4) Usually consume them at home
- 5) Like eating wild-caught fish / dislike eating farmed fish
- 6) Hard to say / No specific reason
- 7) Refuse to answer
- 8) Other reason: \_\_\_\_\_

26. If farmed reef fish are cheaper than wild-caught reef fish, will you stop or reduce eating wild-caught reef fish and eat farmed fish?

- Yes
- No
- Depends on the taste of the fish
- Depends on the situation / occasion
- No preference/don't know/ hard to say
- Refuse to answer

**Personal information**

26) Sex  M  F

27. Age

- 15-20                       21-30                       31-40                       41-50  
 51-60                       61 or above                       Refuse to answer

28. Occupation: \_\_\_\_\_

29. Average family monthly income

**(If not in RM, pls write down in foreign currency \_\_\_\_\_)**

- 1) RM1,000 & below                       2) RM1,001-2,000                       3) RM2,001-3,000  
 4) RM3,001-4,000                       5) RM4,001-5,000                       6) RM5,001-10,000  
 7) above RM10,000                       8) Don't know                       9) Refuse to answer

30. What is your household size? \_\_\_\_\_

31. Where are you from? (Nationality / Country of residence) \_\_\_\_\_

**(If non-Sabahan, go to Q31. Otherwise, end interview with thank you.)**

32. Before coming to Sabah, did you know you could order Live Reef Fish in restaurants?

- 1) Yes                       2) No

## APPENDIX 2: SURVEY QUESTIONNAIRE – RESTAURANT MANAGER

- |                             |
|-----------------------------|
| 1) Restaurant: _____        |
| 2) Manager: _____           |
| 3) Date of Interview: _____ |
| 4) Time of interview: _____ |

### Questionnaire of Restaurant Managers

- 1) Does your restaurant sell live reef fish (LRF) e.g. groupers, humphead wrasse and giant grouper?  
 Yes                       No                       Don't know
  
- 2) Do you know the source of the LRF sold in your restaurant – Wild-caught or farmed?  
 Wild-caught                       Farmed                       Both                       Don't know
  
- 3) Some fishermen catch very small-sized and immature LRF. Will you purchase such small LRF from your supplier?  
 Yes                       No                       Don't know
  
- 4) There are reports that many coral reefs in Sabah are over-exploited. Are you worried about the supply of LRF decreasing in the future?  
 Yes, we are very worried                       Yes, we are worried  
 No, not worried                       No opinion
  
- 5) Mass removal of immature fish would lead to over-fishing. Is there any impact to your business if the Sabah Government limits certain size of LRF catches or imports into Sabah?  
 Yes, have great impact                       Yes, have some impact  
 No, no impact                       No opinion
  
- 6) Should the above be implemented, would you support the move?  
 Yes                       No                       No opinion
  
- 7) Some fishermen catch LRF with cyanide. What is your opinion of such fishing methods?  
 Strongly oppose                       Not oppose                       No opinion
  
- 8) Are consumers worried about cyanide poisoning in the LRF that they eat?  
 Yes                       No                       Don't know

- 9) Can you guarantee the LRF provided from your supplier are not caught with cyanide?
- Yes                       No                       Not possible                       Don't know
- 10) Will you purchase the LRF from your suppliers if they are known to be caught with cyanide?
- Yes                       No                       Don't know
- 11) Do you support to certify fish suppliers as to allow consumer to select fish products from sustainable sources, e.g. catch fish without using destructive fishing methods, in certain size limits and quotas?
- Yes, support                       Not support  
 Not sure, will consider                       No opinion
- 12) If the certified LRF were more expensive than uncertified fish, do you think your customers are willing to buy?
- Yes                       Maybe                       No                       Don't know
- 13) Do you think it will help your business if you serve certified LRF and establish a green image (environmentally friendly)?
- Yes                       Maybe                       No                       Don't know
- 14) Has your business been affected by ciguatera fish poisoning?
- Yes                       No                       Don't know                       No Opinion
- 15) If farmed LRF has lower opportunity of ciguatera fish poisoning and lowers the overfishing problem of wild-caught LRF, will you recommend your customers to choose farmed LRF?
- Yes                       Maybe                       No                       Don't know
- 16) Has your business been affected by the red tide poisoning?
- Yes                       No                       Don't know                       No Opinion
- 17) Humphead wrasse is vulnerable to overfishing because of its biology. Is there any impact to your business if this species is banned from being sold in Sabah?
- Yes, have great impact                       Yes, have some impact  
 No impact                       No opinion
- 18) If WWF-MALAYSIA would like to promote environmentally friendly consumption of LRF in your restaurant, which of the following methods are applicable to your restaurant?

- Pamphlets                       Posters                       Video recording                       Exhibition  
 Souvenirs distribution  All of the above  
 Others,                      please                      specify:
- 

None of the above

19) Can you estimate the total number of customers eating at your restaurant in a month?

\_\_\_\_\_

20) How many tables do you have in this restaurant? \_\_\_\_\_

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CORAL TRIANGLE SUPPORT PARTNERSHIP  
One Wolter Place, Jl. Wolter Monginsidi No.63B, Kebayoran Baru, Jakarta 12180, Indonesia  
[www.uscti.org](http://www.uscti.org)

